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* Note to *Reader*. These are to be bound to follow the last number in the volume of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

Original Communications.

OBSERVATIONS ON CASTELLANI'S BRONCHOMONILIASIS, WITH REPORT OF A CASE WITH PNEUMONIC ONSET AND A PECULIAR CLINICAL COURSE.

By NAJIB FARAH, M.D.

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BRONCHOMONILIASIS was first described by Castellani in 1905 in Ceylon. It was later confirmed by other authorities in other parts of the world. The disease is frequent all over the tropics, especially in localities with damp climates. It has also been recorded in sub-tropical and temperate zones. Pijper described cases in South Africa, Chalmers and Macdonald in the Sudan, and myself in Egypt. It was recently found in Europe and America. Iacono recorded cases in the South of Italy; Magrou and Pinoy in France; and only very lately, in 1920, Castellani himself met with a case in England (*Lancet*, April 24, 1920; Castellani: "Higher Fungi and Human Pathology," p. 898). Thorough investigation, I believe, will tend to prove that the disease is possibly world-wide, and from a nosological standpoint every case of bronchitis, especially in long-standing cases, should be well studied and cultures from the expectoration should be obtained.

ETIOLOGY AND MODE OF INFECTION.

The *Monilia* fungus appears to be the genuine cause of the disease, and several species seem to be responsible, as no other etiological factor such as tubercle bacilli, &c., could be detected in the sputum. In all the cases I observed the probable fungus at fault is *Monilia pinoyi* (Castellani 1910), having myself proved its pathogenicity on rabbits by intravenous inoculation (*Presse médicale*, 7 Septembre, 1921). In Ceylon, the usual variety met with is *Monilia tropicalis* 1910. Other varieties are also observed, but it is doubtful whether all are pathogenic, namely: *M. guillermondi* (Castellani 1910), *M. pseudo-tropicalis* (Castellani 1910), *M. bronchialis* (Castellani 1910), *M. pulmonis* (Castellani 1911), *M. paratropicalis* (Castellani 1912), *M. chalmersi* (Castellani 1912), *M. bethaliensis* (Pijper 1918), &c.

As to the mode of contagion with the fungus, nothing is yet well known. It may, however, be transmitted from man to man; or as a saprophyte living in nature, growing, for instance, on decomposing wood, dead leaves and fruit, it becomes pathogenic. In Ceylon, tea tasters or workmen working in tea factories are often infected with the malady. The former, to judge the quality of the tea, sniff up into their nostrils tea leaves containing monilias and hence contract the disease; whereas in the factories the illness is acquired by the constant inhalation of tea dust floating about in large quantities. Castellani examined the expectoration of some of these workmen, and found it

practically always contained fungi of the genus *Monilia*.

The *Monilia* organism, as is found in fresh smears of the expectoration, is cellular, in shape roundish or oval, often exhibiting a double outline. It is usually seen alone and rarely with pieces of hyphae. It is Gram-positive. The different species of the fungus cannot be distinguished from each other by purely morphological and botanical characters. Cultural researches and biochemical reactions are indispensable for identification. It grows well on agar, but more so on glucose and maltose agar, especially if slightly acidulated. My cultures were usually made on Sabouraud's maltose agar, producing a very distinct white opaque rather large roundish growth.

SYMPTOMATOLOGY

The dominating clinical aspect of bronchomoniliasis does not differ from that of tracheo-bronchitis. However, various grades of the disease are described, and its course is usually protracted and may last several years. It usually attacks adult life, and may often be observed in old age.

Mild, intermediary and severe types are recognized. The symptoms in general are: Dyspnoea, cough, expectoration with or without blood and fever. The disease is characterized by frequent remission and fresh exacerbations. In the remissions the fungus grows less or may entirely disappear from the sputum. Associated forms with other respiratory affections, such as bronchopneumonia, &c., may also be met with.

Mild Type.—The patient looks well and complains of slight cough. The expectoration is mucopurulent yellowish, greenish, or whitish in character and very often scarce, with no blood at all. The disease may end spontaneously within a short period or last longer, remaining stationary or passing into the severer types. In one of my cases it was of nine months duration. The physical signs of the chest very often yield nothing at all, or very rarely few rules may be heard.

Intermediary Type.—Under this type are grouped cases of intermediate gravity between mild and severe forms. The patient complains of more or less severe cough, dyspnoea, and not infrequently of sub-continuous fever. The disease is stubborn and may last for years, and may end in the severe type. The cough is insidious in its onset and varies in severity and frequency in different cases, depending rather upon the character of the bronchial secretion and the seat of the inflammation. Thus when the expectoration is tenacious and scarce, and when the finer bronchi are attacked, cough is most severe. It comes often in paroxysms, and it is worse in the morning and at night than in the daytime, and varies also with the weather and season. It may be severer in summer. Dyspnoea is commonly observed and varies in degree, depending upon the extension of the inflammation to the finer tubes. The expectoration differs greatly in different cases. It may be absent, scarce, mode-

rate, or abundant. As a rule it is rather copious. When the cough is dry and the expectoration is present it is expelled with great difficulty. It may be viscid, whitish, or muco-purulent yellowish or greenish in character and sometimes tainted with blood. Crisis of hæmoptysis may very rarely occur. Fever is usually absent, though sometimes now and then during the course of the disease a sub-continuous or continuous fever is declared, and the rise is usually in the evening. The bodily nutrition may be well maintained. Sometimes the patient looks well and his appetite is good. At other times he is thin and weak. The physical signs of the chest do not differ from those of chronic bronchitis. Dry and moist râles of various forms may be heard, especially over the lower lobes. The respiratory murmur in places may be increased or diminished or totally obscured by râles. Emphysema may be associated.

Severe Type.—This type has a chronic run and almost invariably ends fatally. One or both lungs may be affected, and the pleura is frequently implicated. The patient complains of cough and often expectorates blood and has hectic fever. His appetite is bad and his looks emaciated. The course of the disease is closely similar to that of phthisis or of chronic broncho-pneumonia, and is characterized by frequent remissions and fresh exacerbations. The onset may be quite slow and gradual or may be acute, pneumonic in character (as in the case I am exposing hereafter), the patient presenting similar symptoms and signs of acute lobar pneumonia with rusty sputum. The physical signs of the chest yield patches of dullness due to consolidation and pleural thickening, bronchial breathing, diminished or entirely absent vesicular murmur, crepitations, pleuritic friction sounds, and later on signs of cirrhosis of the lung with its sequelæ.

The case referred to above, and which I propose to describe here, had a very remarkable and clinical course of utmost interest to be related. The patient, a well-to-do manufacturer of soap and a refugee from Jaffa, Palestine, 55 years old, twenty-six years married, had five children all in good health, smoked moderately, did not drink, never had venereal disease nor gave any history of family predisposition, was taken ill on August 15, and died—two years and seven months later—on March 25, 1920. At the age of 30 he had a hæmoptysis for three consecutive days and was kept in bed for a fortnight. He never coughed neither before or after that event; on the contrary, he was well and strong and consulted my distinguished professor, the late Dr. Harris Graham, who told him that it was not phthisis. His expectoration did not reveal any tubercle bacilli.

On August 15, 1917, he woke up in the middle of the night with uneasy respiration and willingness to cough, and felt heavy behind the sternum. He then coughed up a tough bloody catarrh, followed by a hæmoptysis. There was no temperature and the expectoration contained no

tubercle bacilli. He was kept in bed for a few days, after which he resumed his work as usual, but felt weak, easily out of breath, and coughed slightly with very little sputum. Four months later, on December 20, he felt chilly and feverish and consulted a physician in Cairo, who told him that there was a catarrh of the upper part of the left lung (most probably he suspected phthisis). Four days later in Alexandria the patient had a marked chill, followed by 40° C. temperature, and felt a stitch on the left side. He coughed severely, and the sputum, yellowish at first, turned to rusty. The family physician, my distinguished colleague, Dr. Valasopoulos, diagnosed lobar pneumonia of the left base. The temperature ranged between 38°-40° C. for twelve days. Examination of the expectoration revealed total absence of tubercle bacilli and pneumococci. This pneumonic-like attack was followed a chronic bronchitis, with now and then a pneumonic-like exacerbation, with a new patch of infiltration over the left lung until practically all the lung was involved, accompanied by a crisis of hæmoptysis and rusty sputum. The patient complained also of frequent chills and perspiration.

The temperature during the pneumonic-like attacks ranged between 37.5°-40° C. for ten to twenty days. Its onset was usually gradual until it attained its maximum and was followed by a gradual descent. In the intervals it practically was slightly hectic. During the course of the disease on only four or five occasions, varying from five days to three months, did the temperature drop down to normal.

The cough was invariably constant and varied in intensity and quality at different intervals. It was rather paroxysmal in character, the paroxysm corresponding to the exacerbation. At the beginning of the paroxysm the cough was dry and not infrequently severe and fatiguing, and was followed by hæmoptysis, and for several days by an abundant rusty sputum, which gradually diminished in quantity, and changed in colour to greenish, muco-purulent and then yellowish. During the dry stage of the cough the chest over the left side presented signs of consolidation and the temperature was usually high, while during the expectoration stage the pulmonary infiltration was in abeyance; the chest yielded signs of resorption and the temperature was comparatively low.

The expectoration of the patient was frequently examined during the exacerbations and in the intervals. No tubercle bacilli nor pneumococci were found. Streptococci, staphylococci, micrococci and saprophytes only were reported. Blood examination was also made. A slight anemia was detected.

Many physicians and surgeons examined the patient and consultations were frequently made, and notwithstanding the absence of tubercle bacilli in the expectoration practically all maintained the diagnosis of chronic fibroid phthisis following the attack of pneumonia the patient had in December,

1917. Chronic empyema was also suspected, and several exploratory punctures were performed with negative results. No radiography was made.

In May, 1918, I was called for the first time to examine the patient and to give my opinion whether there was any fluid in the left pleural cavity. I diagnosed a probable pulmonary mycosis, as the clinical course of the case struck me to be very strange compared with the ordinary lung diseases. The patient presented the following physical signs:—

General Aspect.—Looked weak, had no dyspnoea nor hurried respiration, and easily tired and coughed when he talked.

Heart.—The beats accelerated but regular. The apex in its normal place.

Abdomen.—Liver and spleen were not palpable.

Lungs.—A distinct drawing in and flattening on the left was noticed, and the mobility was distinctly impaired as compared with the right one. The vocal fremitus was diminished on the upper part and abolished over the base. The percussion note on the same side was skodaic in front and relatively dull on the upper part behind, and gradually passed to absolute dullness over the base. The vesicular murmur was indistinct and very distant over the apex behind and totally absent over the base, while it was indefinitely harsh over the supra- and infra-clavicular spaces. Subcrepitant râles were only heard in the axillary region. No friction rub was heard. On the right side nothing pathological was detected, except the respiration was puerile in character.

Examination of the expectoration was very carefully and frequently conducted. In every specimen examined there was total absence of tubercle bacilli, pneumococci, *Spirochæta bronchialis*, *Paragonimus westermanii*, and of any elements of malignant tumour; whereas *Monilia pinoyi*, Castellani 1910, was constantly present.

Inoculations of guinea-pigs with fresh sputum were absolutely negative. Intravenous inoculation of a rabbit weighing 1 kg. with *M. pinoyi* of twenty-four hours' culture caused its death on the sixth day of general acute moniliasis. The autopsy presented the following characters: Intestines and spleen looked normal; liver hyperæmic; lungs inflamed and sprinkled with red ecchymoses; kidneys very big—double their normal size, and studded all over the surface with tiny miliary abscesses, and the Malpighian glomeruli very swollen; thin layers of lung and kidney, stained with phenicated thionin, showed the presence of the fungus *in situ*. Cultures from the lungs, liver, kidney and contents of the heart were also made. *M. pinoyi* developed in all the culture tubes.

Examination of the blood of the patient showed a slight anemia. The fungus gave positive agglutination and complement deviation tests with the patient's serum. Wassermann reaction was negative.

Urine examination presented sometimes traces of albumin and urobilin.

Two months before the patient's death a consultation of Professor Wagner of Moscow, Dr. Valassopoulo and myself was made. Professor Wagner insisted that the case was one of chronic fibroid phthisis. Dr. Valassopoulo agreed with me that it was bronchomoniliasis, as was especially evidenced by the constant presence of the monilia fungus and the total absence of tubercle bacilli in the expectoration and the negative animal inoculations.

The patient grew weaker, though his bodily nutrition was sufficiently maintained, and the physical signs over the left lung became more and more marked, and the fibroid infiltration with pleuritic thickening became more and more extensive until, six weeks before death, the cirrhotic change in the lung attained apparently its maximum. The right lung presented fine moist râles over the base and was rather enlarged (compensatory emphysema). The chest wall over the left side was very much retracted, and the spinal column laterally curved and was fixed on respiration. The ribs were approximated and the inter-spaces obliterated; the left shoulder drooped over the shrunken chest wall, and the supra-clavicular fossa was about 10 cm. deep down the chest cavity. The apex beat of the heart was displaced downwards and towards the axilla, and the anterior surface came into immediate contact with the anterior chest wall due to the retraction of the lung, and the pulsations were seen over an abnormal extent. Both sounds of the heart were sharp, but the pulmonic second sound was increased and accentuated. Peculiar gradual paretic change with gradual loss of sensation accompanied with pain in the axilla, the left of the neck and shoulder, took place in the left arm to complete paralysis and anæsthesia of the limb. This most probably was due to traction on the brachial plexus by the retracted lung, the plexus being in close proximity to the apex of the lung. It might, however, be due to extension of the inflammatory process from the lung to the adjacent plexus of nerves. The limb laid flaccid with distinct atrophy of the muscles. There was no œdema, neither of the limb nor of the neck or chest, nor any variation in the radial pulse as compared with the right one. The paralysis took place in the following order: Paresis, then complete loss of extension of the fingers, with wrist-drop and loss of supination. Paresis, then loss of flexion of the fingers and of the wrist-joint; of abduction and adduction with loss of pronation. Paresis, then loss of extension of the forearm due to paralysis of the triceps. Paresis, then loss of flexion of the forearm due to paralysis of the biceps. Paresis, then paralysis of the shoulder-joint. Loss of sensation also took place gradually, involving first the regions of the musculo-spiral nerve, then that of the ulnar, median, musculo-cutaneous, internal-cutaneous, circumflex and supra-clavicular nerves. While the skin of the upper half of the inner and back part of the arm and the regions over the thorax and left mamma,

the scapula and latissimus dorsi remained sensitive, the former being innervated by the intercosto-humeral of the second intercostal nerve, and the latter regions by the lateral cutaneous of the intercostal nerves.

The patient also suffered slight difficulty in deglutition, which soon passed away, most probably due to anatomical distortion of the œsophagus by the retracted lung. No enlarged glands could be detected, neither in the axilla nor in the cervical region, nor anywhere in favour of malignancy.

Ten days before the patient's death he was suddenly taken in my presence with a distinct attack of angina pectoris. The patient complained of an excruciating pain behind the sternum, oppressive in character, involving the whole of the chest, radiating to the back, neck and shoulder, and for a few seconds the paralysed arm and the palpebral region of the left eye were thrown into peculiar convulsive twitchings. The patient was very pale and cold and felt an awful sense of impending death, and was bathed with cold perspiration. The respirations were shallow and the heart's action very rapid and irregular. The paroxysm lasted about a quarter of an hour. The patient after the attack vomited and discharged a large amount of clear urine. Blood tension measured with Pachon marked MX13, Mn10. Whether this attack was provoked by an irritation of the pulmonary and cardiac plexuses of nerves and nerve endings of the vagus and of the sympathetic ganglia implicated in the retracted lung, or was caused by any concomitant lesions of the aorta and coronaries or of the heart muscle itself, or by traction of the retracted lung on the heart, thus disturbing its anatomical position, or to a joint action of all these factors, is altogether problematic. It, however, appears very likely to be dependent upon a nervous reflex induced by the local irritation of the very numerous anastomoses of nerves involved in the retracted lung, thus accounting for the vast nervous irradiations, including the convulsive twitchings of the left palpebral region and arm which the patient presented during the crisis.

Three days later slight attacks recurred and soon passed away. The last one was particularly characteristic and was very severe and ended in the patient's death. Unfortunately no autopsy could be obtained, though the patient before death expressed to his family the desire to have it done. The expectoration was carefully examined one day before death, and was found to contain a large amount of *M. pinoyi*, while inoculation of guinea-pigs remained absolutely negative for tuberculosis. The urine contained slight traces of albumin and urobilin.

DIAGNOSIS AND PROGNOSIS.

Primary bronchomoniliasis, as described here, should be well differentiated from the secondary type not infrequently met with in cachectic diseases such as cancer, tuberculosis, diabetes, &c. In these cases the mucous membrane of the mouth, pharynx, larynx and bronchi is covered with the

fungus, whereas in genuine bronchomoniliasis the mouth and pharynx are not affected.

It should also be differentiated from phthisis by the absence in the expectoration of the tubercle bacillus and the negative animal inoculations; from broncho-spirochaetosis and endemic hæmoptysis by the absence of spirochaetes and ova of *P. wasser-manni*. Mixed infection, however, of moniliasis and these conditions may occasionally be met with.

The affection should also be well differentiated from cancer of the lung. Cancer of the lung is rarely primary and is usually secondary, and presents altogether a different clinical aspect. But at the beginning the symptoms in both conditions may be so closely alike as to present serious diagnostic difficulties. The X-ray examination is of utmost significance, and should never be omitted in such cases. In the above-mentioned case it was impossible to convince the patient to have it done. However, cancer of the lung is extremely rare compared with the frequency of bronchomoniliasis as far as the tropics are concerned. The lymph glands in cancer are almost invariably affected, especially the bronchial, axillary and cervical glands, though, according to Jaccoud, this may be inconstant (*Clin. Méd.*, 1867, p. 131). The difficulty in respiration in cancer is, as a rule, very marked, giving rise to intense dyspnoea, and not infrequently œdema of the skin and protrusion of the chest wall in the region of the disease is noticed. Symptoms of compression are of great diagnostic value. Pressure on the superior vena cava produces œdema in the face, neck, chest wall or in one arm, and the subcutaneous veins of these regions are dilated. Pressure on the brachial plexus, œsophagus, trachea or bronchi, and on the recurrent nerve are also, as a rule, sequelæ in cancer of the lung. The case above did not present any such symptoms except paralysis of the left arm and a slight transient difficulty in deglutition, which was rather due to traction of the retracted lung on the brachial plexus and the œsophagus. No circulatory disturbance, however, occurred, neither in the chest wall nor in the arm, and they would have happened, as was also expected in this case, had it been due to any compression; and the supra-clavicular fossa would have appeared bulging and not depressed 10 cm. deep down the chest cavity, the blood-vessels being so elastic as to support the traction without giving rise to any visible symptoms; whereas the nerve fibres cannot withstand such traction, and consequently the paralysis took place without disturbing the circulation of the limb. Last, but not least, cancerous tissue and elastic fibres are revealed in the expectoration of cancer patients. Also humeral reactions in mycosic disease first demonstrated by Vidal and Abrami in 1908 in the serum of sporotrichotic patients are undoubtedly valuable means of diagnosis to be applied in bronchomoniliasis. In this respect, the works of de Biagi, de Donna and Choukevitch on certain species of oöspora are also worth mentioning and are of great significance.

The prognosis is favourable as far as mild cases

are concerned. Intermediary types are chronic and difficult to cure, whereas the severe types as a rule end fatally.

TREATMENT.

Potassium iodide is considered to be specific in this affection, and in fact mild cases often recover with it. 0.50-1.50 gm. dose well diluted in water or milk is given three times daily. In severe cases the drug is useless, and there seems to be nothing of any avail.

Along with potassium or sodium iodide, bal-samics, reconstituents, especially the phosphorical and arsenical compounds with nourishing food and a sojourn in a suitable climate, should never be neglected. Pneumosan injections may prove to be useful, as in the above case. Vaccinotherapy may be tried.

Having myself treated successfully broncho-spirochaetosis with injectable iodine in the form of lipiodol 40 per cent. iodine in poppy oil (*Lancet*, October 4, 1919; *Presse Médicale*, December 17, 1919), I have tried the same preparation in bronchomoniliasis. It is analogous to iodopin, and is not painful or only slightly so when injected. The injection was done intramuscularly in the gluteal region, 2 c.c. being injected on alternate days, and as much as forty injections were given for a cure without any symptoms of iodism. The fungus in all the cases I treated in this way apparently disappeared from the expectoration after the third injection, as was proved by our cultures. The mild and the intermediary cases were greatly benefited; the mild cases in fact recovered completely. The severe case above described was greatly ameliorated for a period of three months, during which the patient coughed very little, had no fever, went out of doors, and seemed to be recovering. But unfortunately a relapse occurred, and this time neither lipiodol injections nor anything else were of any benefit to the patient, and the fungus was again found in the expectoration.

I greatly recommend the use of injectable iodine in bronchomoniliasis; it should be instituted as soon as possible immediately after the diagnosis has been made. This mode of administration of iodine is preferable to the internal use of potassium iodide, which is often irritating to the gastric mucosa. This treatment appears to be useful in early cases before any serious damage has occurred in the lungs.

PRELIMINARY TRAINING FOR THE COLONIAL MEDICAL SERVICES.

By E. P. MINETT, M.D., D.P.H., D.T.M. & H.

Government Medical Officer of Health, British Guiana.

MOST medical men who decide to devote their lives to tropical medicine either in the Colonial Medical Services, Military Services, or as medical officer to some of the large industrial corporations in the tropics can, I am sure, support the state-

ment that until recent years the medical officer had to learn at least a portion of his work after appointment, with its obvious drawbacks.

My own experience is not unique, I am sure. I was appointed as Government Bacteriologist to the colony, and having held posts as bacteriologist in large London hospitals for over two years, I felt myself reasonably safe to tackle any problems that might arise. I found, however, on arrival in the colony that the term bacteriologist was very elastic and covered subjects such as pathology, entomology and public health laboratory work. Very few colonies can afford to employ specialists for each of the above, consequently the bacteriologist is expected to be an expert in several branches of his profession instead of the narrower and more highly specialized work required in Great Britain. Within a month of my arrival in the colony I was required to carry out a chemical analysis of water, give an opinion on a growth suspected to be malignant, identify a mosquito and a biting fly. Although none of these would have been a very serious problem to a man of long experience in tropical laboratory work, still, I submit they are work not usually undertaken by a bacteriologist in England, and had I not had the advantage of a course at the London School of Tropical Medicine and outside public health laboratory experience, the work required would have been very difficult. I am often told by my colleagues that their experiences in this respect are similar to my own.

Now that the medical profession is recovering from the effects of the war and young medical men are becoming available for appointments abroad in increasing numbers, I venture to put forward the following suggestions and to invite the opinions of my colleagues in the tropics. The two classes of medical men who take up work in the tropics can broadly be defined as follows:—

- (1) General medical officers, and
- (2) Specialist medical officers.

The following preliminary training is suggested:—

(1) GENERAL MEDICAL OFFICERS.

After qualification and registration the applicant for a post in the tropics might be required, before proceeding abroad, to spend at least six (6) months at a recognized general hospital as house surgeon and house physician, followed by the usual course at the London, Liverpool or other recognized School of Tropical Medicine. He should then be required to pass the examination and obtain the certificate of the School before appointment.

When on leave medical officers should be encouraged and given extra leave on full pay to enable them to take out post-graduate courses in special subjects, such as eyes, ears, throat, &c. The general opinion of the members of the recent West Indian Medical Conference was strongly in favour of the value of post-graduate training, and its adoption forms the subject of one of their resolutions forwarded to the Secretary of State for the Colonies.

(2) SPECIALIST MEDICAL OFFICERS.

For men applying for special posts, such as health officers, pathologists, bacteriologists, &c., the following course of preliminary training is suggested:—

(a) At least one year's post-graduate appointment at a recognized general hospital in special subjects, such as pathology and bacteriology, or a similar period as assistant to a whole-time medical officer of health.

(b) He must then join a recognized School of Tropical Medicine for two (2) years; during the time he will be employed as demonstrator to the various classes held at the School, and in addition be attached as special assistant for three (3) months to each of the professors or lecturers in the following subjects: Tropical Pathology, Sanitation, Helminthology, Protozoology, Bacteriology and Entomology.

(c) He should be required to take the diplomas of D.P.H. and D.T.M. before appointment.

ORGANIZATION.

I suggest the following as a base plan for consideration:—

The Colonial Secretary might be asked to appoint two men annually for training as special medical officers on the above lines and attach them for training to the School of Tropical Medicine after their preliminary special training as at (a) has been complied with.

FINANCE.

The Colonial Office might ask the various Colonial Governments and large industrial interests requiring such specialist medical men to subscribe a small sum annually to provide for this training and so provide a small depot of trained men. The men selected for training might be paid a sum of, say, £200 rising to £300 per annum, dependent on their obtaining satisfactory reports on progress made. Free board and lodging should be provided at the hospital or school, and in addition they might perhaps be allowed fees for private coaching.

APPOINTMENT.

In view of their special training these men should be given seniority in the service, for purposes of pay and pension, as follows:—

(a) General medical officers, one year's seniority.
(b) Specialist medical officers, three years' seniority.

The amount of seniority given will be roughly the time each officer has spent in special preparation before taking up his duties.

All medical officers should be provided with free furnished quarters and the necessary travelling, subsistence and duty allowance in the service to which they are appointed.

CONCLUSION.

If a scheme on the above lines, or a modification of the same could be adopted, it will mean that a

small number of men will always be available for appointment to specialist posts as required, and the medical services concerned will gain by the increased efficiency and the fact that these men will not have to gain at least a portion of their knowledge after appointment.

A CASE OF COMBINED PELLAGRA AND BERIBERI.

By RALPH W. MENDELSON, M.D., D.P.H.

Principal Civil Medical Officer, Royal Siamese Government, Bangkok, Siam.

This case is reported for two reasons. With the exception of a reference to the occurrence of pellagra in Siam ("Tropical Diseases observed in Siam," *Journal of the American Medical Association*, vol. lxxii, No. 17, April 26, 1919), I know of no mention of the disease as occurring in this country, and I believe that this is the first acute



case observed. A few chronic cases I have recognized, but in my experience of over five years, dealing with a large number of patients in a free clinic in one of the local charitable hospitals, no other acute case has been diagnosed. Considering the fact that during that period more than fifty thousand patients have passed through the clinic it would seem justifiable to report the case, especially in view of the fact that in the Federated Malay States such cases are not uncommon, at least so I have been informed.

The second reason for reporting the case is that, as far as I am aware, a combined case of pellagra and beriberi does not appear in the medical literature. But my opportunities for making a careful search for the same are limited, and if I have overlooked such a reference I stand corrected.

The history of the case is as follows:—

The patient is a native Siamese, never having been out of the country. His previous history is negative. He reports that until his present illness developed he has always been well. It must of

course be remembered that the previous medical history of a low-class native as related by himself is often of very little value. There is no history of venereal disease, malaria, dysentery or other acute intestinal illness, previous attacks of beriberi (nep-cha) or pellagra. In so far as it is possible to determine, the patient has suffered no previous illness of a serious nature or that could have any bearing on his present condition. With the exception of taking a few doses of native medicine there was no previous medication, and there is no history of acute or chronic metallic poisoning.

The patient is 27 years old, single, and his occupation is that of a conscript policeman—this means that he is serving his military duty of two years as a policeman. He appeared in the clinic complaining of difficulty of walking, a feeling of tightness and numbness in the legs, sore tongue, diarrhoea, and a peculiar eruption on the scrotum, hands and feet.

His physical examination revealed the following: Head, neck and eyes negative. Eye reflexes normal. Tongue swollen, red with few raw patches, very painful, patient unable to masticate his food. Thorax negative, lungs and heart quite normal, no valvular lesions. Upper extremities normal as to reflexes. The backs of the hands look as though they had been painted with iodine. There are a few bullæ and vesicles.

The abdomen is negative. Spleen and liver normal. Some slight tenderness over the entire abdominal area, the result of excessive bowel movements, with the possibility of mucous membrane involvement of the same.

The lower extremities show the left knee-jerk hardly perceptible—just a very slight contraction of the knee muscles. The right knee-jerk is completely absent. The feet are as shown in the illustration, some bullæ and vesicles. The gait is typical of that in an acute polyneuritis of the lower extremities. There is no œdema.

The scrotum is quite typical of acute pellagra.

The temperature is normal, the pulse from 100 to 120 per minute. The mind is quite clear.

Laboratory Findings.—Urine is normal, no sugar, albumen or casts. The white blood count is 15,000. Examination for malaria negative. Blood Wassermann negative. Fæces are negative for intestinal parasites, except for round worm—hookworm negative.

The diagnosis is *acute combined pellagra and beriberi*. This is a very interesting case. Beriberi is very common in Siam, and especially common in the police force. The principal staple diet is rice—white, finely polished rice. There is no control over this diet unfortunately. Of the hundreds of cases of beriberi that develop in the police force, this is the first case of pellagra that I know of. The diet of this patient has in no way been different from that of the other policemen. He runs true to form in the development of his beriberi. Is it possible that his metabolic mechanism has for some unknown reason suddenly

refused to assimilate the necessary food elements that are present in his ordinary diet in sufficient quantity to protect him from pellagra? In view of the history of food deficiency diseases in the police force, it would seem that the diet of these men contains the necessary pellagra preventive elements, but not the necessary food elements for the prevention of beriberi.

THE TREATMENT OF LEPROSY BY THE INTRAVENOUS INJECTION OF CHAULMOOGRA OIL.

By PHILIP HARPER.

Medical Superintendent, Makogai Asylum, Fiji.

In two previous papers in this Journal (No. 10, vol. xxiv, of May 16, 1921, and No. 1, vol. xxv, of January, 1922) a short account was given of the treatment of leprosy by the intravenous injection of chaulmoogra oil.

The thirty-seven cases therein described have now been under treatment for about two years, and a more definite opinion of the value of the treatment is now possible. At the date of the last report (July, 1921) it was considered that twenty-eight cases had improved, six had remained unchanged, and three were worse. Between that date and the end of August, 1922, five of these cases have been discharged from the asylum, five have continued to show improvement (although in one of these there is an increase in the wasting of the muscles supplied by the ulnar nerve with corresponding contraction of the little finger), twelve are apparently unchanged, and fifteen are worse.

Twenty-six of these cases are of the nodular type, and were mostly very advanced when the treatment was started for them as a measure of desperation. All the five discharged cases were of the purely nerve type. The nodular case (No. 13 of the report of July, 1921) which was described as apparently cured has relapsed.

Altogether 265 cases at Makogai are, or have been, on treatment by the intravenous injection of chaulmoogra oil for periods of from a few weeks to two years. They have received forty thousand intravenous injections of the oil without any serious mishap.

The results are as follows:—

Dead, 11, of whom 5 were very aged; improved, 28, including 15 discharged from the asylum; unchanged, 195; worse, 31; total, 265.

Other attempts at specific treatment:—

(1) Intravenous injection of tartar emetic is useless for leprosy.

(2) Of cases treated by sodium hydnocarpate, four in all, two have become worse and two have remained unchanged.

(3) Of eight cases treated by sodium morrhuate, none showed any improvement and one got worse.

(4) Moogrol intravenously and intramuscularly was used in ten cases, of whom four got worse and six remained unchanged. I am now increasing the dose in picked cases to 10 minims intravenously per diem.

(5) I am trying tuberculin. So far I believe it to be useless, as none of the cases has yet shown signs of improvement.

My conclusion is that treatment by intravenous injection of chaulmoogra oil is of value in early cases, and is preferable to treatment by sodium gynocardate, sodium hydnocarpate, or sodium morrhuate. The moogrol brand of ethyl esters of chaulmoogra oil is too painful for intramuscular use, but is much more easily borne intravenously (in doses of 10 minims daily) than the crude oil. Whether the esters are as potent for good as the crude oil I am not yet certain.

DOSAGE.

I give from 5 to 10 minims of the crude chaulmoogra oil, sterilized by heat, without the addition of any other drugs, every day except Sunday for three weeks at a time, then resting the patient for two weeks. Iritis, laryngitis and acute tuberculosis are indications for caution.

In conclusion, I venture to make a very short comment on the pathology and the prognosis of leprosy. Pathologically, leprosy is a multiple granulomatous epi-, peri- and endo-neuritis. Nodule formation in the skin takes place only after the disease has existed for years and is an extreme and late manifestation of leprosy. There is no such thing as a case of purely nodular leprosy. In all nodular cases, and in all cases with infiltrated patches, if they be carefully examined, there will be no difficulty in demonstrating clinically the signs of their multiple neuritis. A teased preparation of the inflamed portion of a nerve during an acute exacerbation of leprosy shows enormous numbers of lepra bacilli massed in columns amongst the fibroblasts, which appear to be the response of the tissues to the invasion of the bacilli. The inflammation of the nerve either resolves (especially after incision of the epineurium with gentle stretching of the nerve) or progresses to the formation of fibrous tissue which in extreme cases contains no nerve fibres at all. Such a fibrotic nerve is really cured. The lepra bacilli have gone, but the anaesthesia, paralysis and trophic lesions may remain, just as a scar remains in the lung at the site of a cured tuberculous lesion.

Leprosy is one of the mildest diseases known to science, and should be regarded, as is done in the case of tuberculosis, as "open" or "closed," "infective" or "non-infective."

Rigid compulsory segregation of all cases, arrested or progressive, must defeat its own object.

For success in treatment early diagnosis is essential.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY I, 1923.

1923.

THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE is approaching the twenty-fifth year of its existence. A quarter of a century in the history of any periodical is a goodly time and tempts one to become reminiscent, and a short sketch of its beginning may not be out of place. It was in the

winter of 1898 that the writer commenced to preach the necessity for a journal on the subject of diseases in the tropics; 1898 was an auspicious year in the study of tropical medicine—for during 1896, 1897 and 1898 Manson's mosquito-malaria theory was struggling for recognition, and was attacked by some of the ablest men of the old school. When the writer unfolded Manson's theory to Sir Joseph Fayrer, Bart., he said: "As soon attempt to keep the wind back by a five-barred gate as to stay that terrible scourge by microscopes and the destruction of mosquitoes." The fight, however, gained its victory, and tropical medicine was founded on a solid basis and served as the starting-point of modern medicine in every branch. It was during this period that the writer suggested to Manson the issue of a journal of tropical medicine. The writer also went to the authorities of the *British Medical Journal*, and pointed out to them the necessity for such a journal; they agreed to give a couple of pages to tropical diseases, but said that it was not an opportune moment to start an independent journal. Considering this concession insufficient, the writer did not jump at the offer, and told them that he intended to bring out a journal, and begged of them not to condemn the appearance of yet another medical publication. The writer next approached the *Lancet* with the same statement, and also brought it before the editors and proprietors of one or two other medical journals of the day, and even spoke to several well-known publishers of lay and semi-scientific magazines, but all stated that it was perhaps premature and largely a question of money. However, they encouraged the idea, and promised not to publish anything against the writer's carrying it out.

This he proceeded to do, and approached Messrs. Bale, Sons and Danielsson for advice. The first Journal appeared in October, 1899, the writer undertaking to finance and edit it. It was always intended to be a journal for the medical practitioners in the tropics, and the publication of papers of general interest as well as of scientific discovery.

The reason for the writer taking so keen an interest was due to the fact that he had witnessed at close quarters the establishment of the three primary diseases in which the parasitic nature of disease was first firmly established. In 1883 he was one of the twelve doctors sent from Britain to Egypt when CHOLERA raged there, and he was present in Egypt when Koch discovered the cholera bacilli and proved the part it played as the cause of the disease. The second disease the writer was brought in immediate contact with in which germs were the active agents in the spread of disease was when in 1896 he joined Manson in Hong-Kong and learned the part played by FILARIA in the blood in the production of elephantiasis. This time also he learned the spread of disease to man by insects, the carrier being the mosquito. This lesson taught the writer by the great discoverer himself at first hand caused an impression

of lasting significance. The third disease that came within the horizon of the writer's ken was the discovery of the *plague bacillus* in Hong-Kong in 1894 by Yersin. Kitasato had a week previously found a bacillus—a pseudo-bacillus—in the blood of the plague-stricken, but it was with Yersin that the writer worked, and he did every step in common with that bacteriologist, whilst his name was as yet unknown to the world of fame. The writer suggested to Yersin that the rat was the carrier of the disease, the fact having been disclosed by the suggestion to the writer by a clergyman in Hong-Kong, gathered from reading with him the 4th, 5th and 6th Chapters of the First Book of Samuel in the Old Testament. Having become convinced by the biblical account, the writer immediately *compelled Yersin to listen* whilst he (the writer) read the tale in the Bible to him. The rat was proved to be the animal by which the plague bacillus was transmitted to man. On this tripod so intimately were three of the great scourges of mankind brought to the writer's cognizance that the spread of disease to man was by germs that he was in 1896-97 ready to accept Dr. Sambon's teaching that diseases in the tropical and sub-tropical areas of the world were not due to climate but to germs, and that given a germ-free district disease was set at defiance. Sambon had many opponents to his theory that living organisms and not climate were the reason of the white man being rendered incapable of maintaining his health and the continuance of his species in tropical countries. Of important men he knew of, only four—Manson, the late Professor Blanchard (Paris), Surgeon-General Rho, Italian Navy, and the writer—cordially supported his contention.

These were the reasons why the writer resolved to found a *Journal of Tropical Medicine*, and, further, he founded a Society, now the Royal Society of Tropical Medicine and Hygiene. During the first twelve months the *Journal of Tropical Medicine* was used as the Journal of the Society, but later the Society founded its own journal. The cause for this being done was another argument for the writer later handing over the original proprietorship of the Journal to Messrs. Bale and Sons, so that a one-man proprietor should no longer be regarded as a desirable one. These details seem but a personal account, interesting to the writer and for his own glory. Far other is the reason; it only shows what enthusiasm may carry one to. The publication he contemplated was rejected by others, as the capital required (some £3,000 to £4,000) to start it was unwise.

All medical journal authorities and private firms doubted and finally refused to undertake it. It was the lessons he learned from witnessing what had been found in the close touch he had had with cholera, filariasis and plague that led the writer beyond the sphere of prudence to embark in a venturesome enterprise. As time went on the circulation of the Journal was "checked" in its increase, so much so that Messrs. Bale, Sons and

Danielsson advised the writer that the Journal should be withdrawn from publication to prevent further loss to the writer.

The advice was kindly given—as all Mr. Henry Bale's advice is—unselfishly, honestly, having no thought of self, wisely and true-heartedly. Messrs. Bale had nothing to lose by continuing to print and publish the Journal, the writer being the proprietor and being ultimately responsible for all finances. Their advice was to one who had started a fresh journal with no readers behind it, for modern tropical medicine was not yet born, and all in front was precarious. It was consideration for the writer's welfare that prompted Mr. Bale to give this advice from what he saw of the publication. The circulation had ceased to increase, and remuneration to the proprietor was out of the question. He advised that the Journal be withdrawn. At this time the publication was a monthly one. Enthusiasm, however, ever a moving power where tropical medicine was concerned, prompted the writer to declare for the Journal being published fortnightly instead of monthly, and accordingly it henceforth came out *twice* a month, with the writer's proviso that if it did not flourish then it should appear *weekly*; and in a further burst he declared it should be sent out in the form of a pamphlet *daily*. Messrs. Bale, seeing that it was impossible to check this spirit in the writer, proceeded patiently to preserve the Journal. They have done so through twenty-five years of time, and it now enters the second part of the half century of its existence with many points of credit to its history, and with many friends to see that its importance grows and its usefulness is maintained. The writer was often warned that the Journal, being a "one-man Journal" affair, would not thrive, and he resolved to do away with this stigma to its name, and offered the paper to Bale and Sons' firm for purchase at their own terms. This Messrs. Bale and Sons consented to do, and in the year 1904 the *Journal of Tropical Medicine* became the property of Messrs. Bale's firm, and totally independent of the "one-man proprietorship" regime.

Of the many subjects which have been brought forward in the pages of the Journal from time to time, none stands out more prominently than that of the elucidation of sleeping sickness and the bringing to bear upon it specific preventive measures. From the time that the London School of Tropical Medicine took a part in the organization of the expedition against sleeping sickness that was playing havoc in Uganda, the Journal until its complete elucidation followed the inquiry step by step, and was the first to make the announcement of each step in the discovery until it was thoroughly worked out. Thus it first announced the discovery of the trypanosome (*T. gambiense*) in sleeping sickness by Castellani and the rôle played by the dusky tsetse-fly (*Glossina palpalis*) in its transmission. Sambon worked out the transmission of the infection, in London, entirely on epidemiological

grounds, his paper appearing in our Journal of July 1, 1903; he assumed upon scientific grounds that the parasite went through a cycle of development in the tsetse-fly. Surely one of the most extraordinary prophecies, based not on guesses but upon sound scientific truths. Prophecy on scientific lines such as these shows the importance of epidemiology, a subject which is sadly neglected in our time. This prophecy was not only right with regard to the agency of the tsetse-fly, but pointed out the exact part played by the fly as a necessary fostering host of the parasite, as to a high authority's view that the tsetse-fly acted merely as a passive carrier, just like the vaccine needle, in the transmission of both nagana and sleeping sickness. That Sambon was right as to the part of host played by the tsetse-fly—a fact which was first denied by critics, but subsequently proved—fully justified our original contention that Sambon was correct in publishing it, although we alone in any country did so. Sambon's anticipations—prophecies one is tempted to call them—were fully adopted by the Journal, and led to some sharp arguments and contentions in the field of parasitology. Our readers will remember the battles he had with Professor Loos of Cairo on schistosomiasis, his articles on blood parasites, such as haemo-gregarines and leucocytozoa, and, above all, his revision of the Linguatulid and Pentastomida, to which we devoted a whole Journal. To do so may have been unsatisfactory journalism, but for a work of such magnitude and intricacy to be divided between the December 15, 1922, and January 1, 1923, numbers meant they would have had to be bound in separate yearly volumes. No more welcome contributor the *Journal of Tropical Medicine* had than the late Dr. Albert J. Chalmers of Khartoum. First from West Africa, then Ceylon, and finally from the Wellcome Laboratories of the Gordon College, Khartoum, the pages of the *Journal of Tropical Medicine* were adorned—this seems a wrong expression to use, but it is done advisedly, for Dr. Chalmers' articles we have long upheld as masterpieces of clinical literature. The readers of the Journal will remember perhaps a leader devoted to the subject of the *style* of his clinical reports, not to mention the subject matter, which were examples of an art in medicine seldom met with. We had looked forward to Dr. Chalmers taking up the editorial work in connection with this Journal when he reached home, and the disappointment to the present writer was acute when he was snatched from us so suddenly and so cruelly.

To his great colleague in spirit, in work, both clinical and literary, Dr. Castellani, we (the Journal) are more than indebted, for to him the Journal owes a scientific distinction and a loyalty of unwavering type. He has brought to Ceylon a reputation in science which it never had before, and will never exceed in future; he has brought to himself a widespread fame; and to the Journal a foremost place. We are tempted to dwell on the

names of the two men bound together by the clasp of the *Manual of Tropical Medicine*.

Of the early workers in the cause of the *Journal of Tropical Medicine* we need only here recall the names of Manson, Ross, Professor Simpson, Sambon, Sandwith, Daniels, Low and Rees, &c., for under their auspices, and with their immediate advice and literary help the *Journal* saw the light of day.

Of the many subsequent helpers it is to be hoped they will continue to serve the *Journal* the original editors and contributors started, and after twenty-five years of initiation hand over to their successors, preserved as it has been through war time and peace, to fight its future battles and build yet a higher repute on a surer foundation.

Editorial Notes.

PHLEBOTOMUS FEVER.

SAND-FLY or phlebotomus fever and *Phlebotomus papatassi*, the insect vehicle of the unknown virus of the disease, have for some time been the subject of special study by Squadron-Leader H. E. Whittingham, R.A.F.M.S.

In November, 1921, he demonstrated the presence of spirochaetes in the blood of patients in Malta alleged to be suffering from sand-fly fever [1]. His findings, however, have not received corroboration from subsequent observers, nor has the spirochate been described in the sand-fly. No claim was made for the specificity of the spirochate isolated.

No other suggested solution of the nature of infection has yet been forthcoming than the original supposition as to the probability of its being an ultra-microscopic filter-passing virus, based on the fact that if the blood of an infected patient be withdrawn during the first twenty-four hours of fever and filtered through a Pasteur candle, injection of the filtrate is capable of setting up an attack in a previously healthy subject.

Woodcock [2], however, has recently challenged the belief as to the filter-passing viruses being living organisms, and considers that their nature is better explained by the theory that they may be products of the disintegration of the nuclei of cells, resulting from the action of pathological enzymes.

The rôle of the sand-fly as the transmitter of the virus was first established by Doerr in 1908, and later confirmed by Kilroy, who, having exposed himself to insect infection, contracted the fever, and then communicated it in the first twenty-four hours by injecting his blood into a healthy man.

Doerr made the chance suggestion that the virus was probably passed by hereditary transmission from the adult female sand-fly to the succeeding

generation. He failed, however, to trace the development of the fly from the ovum and subsequent stages to the fully formed imago under known and sterile conditions, as successfully carried out for the first time by Squadron-Leader Whittingham. Whether such natural conveyance of infection from adult fly to its brood, or the alternative, that the larva acquires the virus by feeding on the infected faeces passed by the parent or by consuming the dead body of the parent, is the true explanation has not yet been determined.

Two interesting facts emerge from Squadron-Leader Whittingham's observations, namely, that the recently bred imago is capable of infecting human beings, and that the phlebotomus is more than a direct vector.

Apparently the virus does not attain pathogenicity, or is not transmitted, until the fly has lived for some days and has already had and digested a feed of blood.

Infected sand-flies which had been brought over to England from Malta had ovulated before death, and from the ova a new brood of sand-flies were successfully hatched out in a modification of the special entomological chamber devised by Waterston for use in Macedonia. The adult imagos so obtained were found capable of infecting human beings.

Further results of Squadron-Leader Whittingham's work were shown by him at a laboratory meeting of the Royal Society of Tropical Medicine and Hygiene, held on November 16 at the London School of Tropical Medicine, Endsleigh Gardens, when he demonstrated a series of excellent drawings and microscopical preparations illustrating the life-history of the sand-fly and the various stages of development of the ovum, larva and pupa to the imago, which cover a period of about six weeks, dependent on conditions of temperature and humidity.

A specimen of the living larva was also shown, whose development it had been possible to delay by increasing the amount of moisture in the special chamber. The normal larval stage of approximately twenty-four days is divided into four "instars," each concluding with a moult. After the fourth moult the larva then commences the pupal stage, which occupies about nine days before the fully formed imago is hatched. After hatching the wings of the young fly dry in three or four hours, and the mouth parts are sufficiently hardened to enable it to suck blood within twenty-four hours.

The insect copulates in the next two days, and six to ten days later lays its eggs to the number of thirty-eight. Its adult life is only of two weeks' duration, whereas the development stages from the laying of the ovum to the hatching of the imago occupy three times that period.

It may be remarked that, in addition to the undoubted transmission of sand-fly fever infection by *P. papatassi*, the phlebotomus has been suggested [3] as the possible vector of the flagellate of leishmaniasis.

Fuller investigation, therefore, of the important part played by this insect in the conveyance and spread of disease, as well as further light on the nature of the virus of phlebotomus fever, will be awaited with interest.

G. F.

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- [2] *Journal of the Royal Army Medical Corps*, October, 1922, and *Lancet*, 1922, ii, 1022.
- [3] *Lancet*, 1922, ii, November 25. Annotation, "The Pathology of Kala azar."

QUININE NECROSIS OF MUSCLES.

INTEREST in the intramuscular administration of quinine for the treatment of malaria, and in the resulting damage to the tissues at the seat of infection, was revived by Mr. Denham Pinnock at a meeting of the Section of Tropical Diseases, held at the Royal Society of Medicine last June.

The specimen of a tumour was shown, composed of necrotic muscle removed from the buttock of an ex-soldier attending the Ministry of Pensions' clinic, under the care of Dr. P. Figdor.

The patient had suffered from malaria in October, 1916, when on service in Macedonia, and was subsequently invalided home in February, 1917. During the period of four to five months he was treated with quinine intramuscularly by alternate injection into either buttock, and received a total of forty-nine injections. Pain in the right buttock had persisted ever since, and had become increasingly embarrassing from the discomfort experienced when sitting down. A lump was also complained of at the seat of pain.

Examination at the Ministry of Pensions' hospital showed on palpation of the buttock a cigar-shaped tumour, which ran parallel with the fibres of the right gluteus maximus and was movable and tender.

Operation was decided on, and incision over the swelling exposed an elongated cyst, from which there shot out a loose oval body about 5 in. in length, leaving behind its capsule or cyst-wall of shining membrane.

On being cut into longitudinally the tumour exhibited a well-defined central area of glistening white necrotic tissue, irregular in outline, and showing patches of calcification.

In addition to the preserved specimen, microscopical sections of the tumour were demonstrated showing, at the periphery, striated muscle fibres undergoing necrotic changes, which were more obvious towards the edge of the central necrosed mass.

The cystic inclusion of the area of muscle affected, following on the process of necrosis, is undoubtedly an uncommon sequel of the intramuscular injection of quinine, but is evidence of

the long duration of its effects. At the time of the introduction of this method of treatment for malaria, and, indeed, for a considerable period afterwards, the local damage to the tissues caused by the injection of quinine was not at all generally realized, or regarded only as a rare event due to faulty technique or dosage.

Lt.-Col. MacGilechrist, I.M.S., in December, 1917, drew attention to muscle necrosis following on the intramuscular administration of the drug, and Professor L. S. Dudgeon in 1918 made it the subject of special investigation, publishing the results of his researches in the *Journal of Hygiene*, October, 1919.

His conclusions were based on a number of animal experiments and on examinations of post-mortem material from malarial patients who had died at intervals varying as widely as one hour and three months after the injection of quinine.

On the results of these experiments he was led to emphasize the fact, up to that time but little appreciated or recognized, that muscle necrosis was an invariable occurrence, differing only in intensity and duration, and not modified by the degree of concentration of the solution of the quinine salt employed. Moreover, owing to the greater bulk required for the necessary dosage, it was found that no advantage was gained by employing a dilute solution, for the necrotic effect on the muscle was much the same. In the case of the alkaloid, the damage proved to be intensified by the use of such solvent vehicles as ether, alcohol, olive oil or crocote, and neutral fat, all of which preparations were found to give rise to extensive fibrous myositis and diffuse muscle necrosis at the seat of infection, the effect of the solvent being only slightly inferior to that of the quinine itself.

Microscopical examination of human muscle from patients dying of malaria showed that the process of necrosis took place very rapidly, and was evident in as short a time as one hour after the intramuscular injection, and in the case of animal experiments occurred within ten minutes. The local effects of intramuscular injection of quinine had also been observed to be prolonged to a period of several months—an unusual instance of which may be regarded the case recorded by Mr. Pinnock—resulting in chronic fibro-myositis, and extending occasionally to involvement of local nerve trunks with fibro-neuritis, consequent nerve paralysis and muscular atrophy.

As the result of necrosis of blood-vessels in the affected area, hæmorrhages into the tissues were found to be by no means uncommon.

The extent of necrosis produced in the animal experiments was not aggravated by rendering the animal anæmic previous to the injection of quinine. This was also borne out by observations on the human subject, for the necrotic changes did not prove to be more pronounced in cases debilitated by anæmia and blackwater fever than in those of uncomplicated malaria treated by intramuscular injection.

Incidentally arising out of his researches, Professor Dudgeon's attention was directed to the hæmolytic activity of quinine, which, though found to be considerable in using 1 per cent. of the quinine hydrochloride in saline, was less potent and rapid than that of 18 per cent. of hydrochloric acid in saline employed as a test control.

The action of the hæmolytic factor would seem to be of importance not only in the local production of muscle necrosis, but is also indeed suggestive in reference to the debated influence of quinine in its relation to blackwater fever, and as a possible determining agent in the precipitation of an attack in some instances. G. F.

Annotations.

The Present Status of Leprosy in the Hawaiian Islands (W. T. Corlett, *Archives of Dermatology and Syphilology*, vol. vi, No. 5, November, 1922).—Leprosy was probably introduced into the Hawaiian Islands from without some time during the last century. The disease spreads rapidly among the Hawaiians because of their intimate mode of living together with their *laissez faire* attitude in regard to the disease. With this complete segregation is difficult of accomplishment.

It is most prevalent during school age. It is most common in the male sex. A specific for leprosy has not yet been fully attained.

Ethyl esters of chaulmoogra oil undoubtedly have a beneficial effect on most cases of leprosy; in some it apparently does harm by aggravating the disease; while in mild or early cases it apparently, for a time at least, arrests the progress of the disease.

Duration of the Protective Effect of Anti-icteroides Immune Serum after Subcutaneous Inoculation into Animals (Hideyo Noguchi, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September, 1922).—Analysis of the records of instances in which non-immune persons contracted yellow fever notwithstanding vaccination shows that the onset of disease occurs soon after vaccination, the longest period being thirteen days. Since the average incubation period in yellow fever is six days, it seems that infection must have taken place in some instances during the period while protection was developing. These instances led to a study of the possibility of immediate protection by means of the anti-icteroides serum. It had already been shown that the immune serum protects at once against experimental *Leptospira icteroides* infection, but it remained to determine how long the protection would last.

Guinea-pigs were given different quantities of the immune serum, and subsequently injected, at various intervals, with a virulent strains of *L.*

icteroides. Complete protection enduring five days was obtained with as minute a quantity of serum as 0.002 c.c. per 1,000 grm. of body weight. After five days, however, the immune substance rapidly diminished, and to keep the animal protected for as long as ten it was necessary to give 100 times as much, or 0.2 c.c. For a man weighing 80 kilos., 0.16 c.c. (0.002×80) would theoretically be sufficient to protect for at least five days, 1.6 c.c. for seven days, and 16 c.c. for ten days. This temporary protection may be a valuable antecedent to that furnished by vaccination, since the final effect of the latter cannot be expected until at least nine to ten days have passed.

Factors controlling Intestinal Bacteria (L. R. Dragstedt, P. R. Cannon and C. A. Dragstedt, *Journal of Infectious Diseases*, No. 3, September, 1922).—The authors are of the opinion that in determining the type of intestinal flora factors other than the diet are concerned. A stasis or a complete obstruction in the passage of the intestinal content results in a proteolytic flora irrespective of the character of the diet. The intestinal secretions do not suppress the growth of Gram-negative bacteria in closed intestinal loops. The absence of utilizable carbohydrate and the alkaline reaction of the medium are probably responsible for the disappearance of Gram-positive aciduric organisms from the closed intestinal loops.

The Blood-pressure of Normal Cantonese Students (W. W. Cadbury, *Archives of Internal Medicine*, vol. xxx, No. 3, September, 1922).—A study of the blood-pressure of 774 healthy male Cantonese youths shows that their average systolic, diastolic and, to a less degree, pulse-pressures, are lower than the standards for European and American youths of corresponding age, weight and height.

The Relation between the Accumulation of Globulins and the Appearance of Agglutinins in the Blood of New-born Calves (Marion Orcutt and P. E. Howe, *Journal of Experimental Medicine*, vol. xxxvi, No. 3, September, 1922).—A comparison of the appearance of the agglutinins for *Bacillus abortus* in the blood of new-born calves with the first appearance of globulins in the same blood following the ingestion of colostrum indicates that the agglutinins are associated with the globulins. These observations are supported by the removal of the agglutinins from serum or colostrum with concentration of sodium sulphate which precipitate globulins present in the blood of calves which have ingested colostrum, but which are not present at birth.

Neither the association of immune bodies with globulins nor the direct absorption of protein by new-born animals is a new fact. The evidence presented is of particular value, however, in associating the appearance of certain protein fractions in the blood of the new-born animal with the simultaneous absorption of agglutinins.

Abstracts and Reprints.

BRONCHO-SPIROCHÆTOSIS IN CHINA.¹

By ERNEST CARROLL FAUST.

BRONCHO-SPIROCHÆTOSIS was first discovered by Castellani in 1905 in patients seen in Ceylon. The spirochætes which he found to be the causative agents were described by him in 1907 under the name of *Spirochæta bronchialis*. About the same time Bertarelli and Volpina noted spirochætes in the sputum of persons suffering from heart disease, while Rona found similar organisms in cases of pulmonary gangrene. Since then instances have been reported from many localities. Lurie recorded the presence of the disease in China, although the first and only published case history found is that of Lee from Wushih.

In view of the widespread incidence of broncho-spirochætosis in Europe, North America, and in parts of Asia (Ceylon, Philippines and Siam), it is surprising to find that the records show the infection to be almost entirely lacking in China. In collaboration with Dr. C. MeA. Wassell, an investigation of the subject was started at the Church General Hospital, Wuchang, among patients suffering from hæmoptysis, and it was discovered that the percentage of cases with broncho-spirochætoidal involvement was markedly high. Examination of suspected cases in other localities in China has revealed a similar condition.

Etiology and Description of the Parasite.—The disease is due to infection with a spirochæte known as *Spiroæma bronchiale*. The infection has been referred to as "Castellani's bronchitis," "broncho-pneumonial spirochætosis," and "broncho-spirochætosis." The organism is polymorphic, with size variations of from 5 to 25 microns in length and from 0.2 to 0.3 micron in width, depending, in part, on the stage of development. Typical individuals have acuminate ends and from five to seven coils. Thus the organism as seen may be thick and short with few undulations, or it may be thin and delicate with several coils. Since the short forms with few coils represent stages that have recently arisen from division of the parent organisms they are less apt to have pointed extremities than longer individuals. The organism may be viewed either in fresh smears with dark-ground illumination or in stained preparations. A

2 per cent. aqueous solution of gentian violet has been found well suited for such staining. In many stained organisms multiple division forms (coccoid bodies) are seen. These are believed to be transmitted by droplet spray in coughing and expectoration.

The life history of *S. bronchiale* has been worked out definitely by Fantham, who finds it to be a separate species. No intermediate host is required. Moreover, Chalmers and O'Farrell have shown by experimental infection of man and monkeys that this is the actual causal agent of broncho-spirochætosis.

The diagnosis is made by examining the sputum in a suspected case and finding the organism, *S. bronchialis*, which may be differentiated from the buccal spirochætes by ascertaining (1) that it comes from the exudate of the trachea or bronchi, and (2) that it is not associated with the fusiform bacilli of Vincent's angina. Thus far, aside from size, actual morphologic differences from the mouth spirochætes have been difficult to demonstrate.

The disease may be simple, or it may be complicated with pneumonia, pulmonary gangrene, empyema, tuberculosis of the lungs, moniliasis, paragonimiasis, or rhinic spirochætosis. While a certain proportion of cases in China will be found to be free from complications, a large share of them will probably prove to be primarily cases of pulmonary tuberculosis with a complication of broncho-spirochætosis. In either instance it is extremely important to examine for these spirochætes the sputum of all persons giving a history of hæmoptysis. If the spirochæte is found to be the primary agent of the disease relief is easily effected. If the disease is complicated by some other infection, then spirochætosis can be eliminated, leaving the physician free to treat the primary agent of the disease. Broncho-spirochætosis may manifest itself as an acute attack, or it may be chronic or sub-acute in its nature. In acute cases a chill develops, then fever, which, according to Castellani, seldom exceeds 39.5° C. This lasts from two to eight days, during which time the patient coughs almost continuously and complains of pains all over the body. The expectoration is scanty, muco-purulent, very seldom containing traces of blood. This type is not likely to be found often in clinics in China, since the patient is reluctant to consult the physician until Chinese medications have been found ineffective. While arsenicals produce rapid relief, the clinical symptoms may disappear even without treatment.

In the subacute type the general symptoms are similar to those of the acute type, but there may be hæmoptysis and bronchitis, with slight crepitations.

In the chronic type the disease may have been slow and insidious in onset, or the patient may give a history of previous acute attacks. When he comes for treatment he has a chronic cough, the sputum is muco-purulent, often blood-streaked, while in many instances there is considerable

¹ Abstracted from the *Archives of Internal Medicine*, vol. xxx, No. 3, September, 1922.

hæmoptysis. There may be moist or dry râles or consolidation areas.

In many cases there is a daily rise of temperature, sometimes reaching as high as 40°-50° C. This is the usual type of patient to be dealt with in China who will present himself at the tuberculosis clinic. In most instances rest and treatment with liquor potassi arsenitis (Fowler's solution), cacodylates, arsphenamin, or neoarsphenamin will bring about rapid recovery and apparent cure.

Cases of lung gangrene, empyema, fetid bronchitis and rhinitis are on record, in which *S. bronchiale* or a similar organism has been the only pathogenic body isolated, but such instances are rare compared with the usual chronic type.

Preliminary inquiries have revealed the presence of broncho-spirochætosis in the following centres in China: Amoy, Nanking, Wusih, Wuchang, Pao Ting Fu and Peking.

Three cases of simple broncho-spirochætosis were reported from Amoy, Fukien Province, with no microscopic evidence of tuberculosis. Two of the patients were Northern soldiers, while one was a native of Fukien Province. They were probably all of the chronic type, with a variable amount of sputum, often streaked with blood. Treatment with tonics and potassium iodide was helpful "as far as immediate results were concerned."

Out of five cases found positive for tubercle bacilli in the sputum in the Nanking Hospital in September, 1921, four were also positive for *S. bronchiale*. These were all chronic cases. Dr. Hutcheson has recently found several cases of simple broncho-spirochætosis.

Lee's record for Wusih was that of a chronic case, with a history of hæmoptysis. Repeated examinations for tubercle bacilli were unsuccessful. Sodium cacodylate per os brought about a rapid recovery.

In September, 1921, Dr. J. H. Wylie of Pao-tingfu brought some smears which contained *S. bronchiale* in large numbers. Several examinations by Dr. Wylie revealed no tubercle bacilli. On entering the hospital the patient had marked hæmoptysis, which recurred every three or five days. He was quite anæmic. He remained in the hospital about three weeks, during which time he was given three intravenous injections of neoarsphenamin, the first consisting of 0.45 grm., and the second and third of 0.6 grm. each. After the third dose his sputum was free from spirochætes. Other cases have more recently come to Dr. Wylie's attention, including one with a history of syphilis, and one in which death resulted from pulmonary tuberculosis. It has been possible recently to confirm the presence of the parasites in patients in Peking giving similar clinical histories.

DISCUSSION.

A survey of the Chinese cases of broncho-spirochætosis indicates two things. In the first place, a certain proportion of the subjects have pulmonary tuberculosis as a primary infection with

a secondary spirochætosis. Secondly, cases of simple broncho-spirochætosis are usually of the chronic type, giving a history of recurrent cough and hæmoptysis for a period of from one to ten years. They differ markedly then from Chalmers and O'Farrell's experiment case and from the cases cited by Bloedorn and Houghton. In Chalmers' cases the infection was under observation from the day of its inception. In each of Bloedorn and Houghton's cases only a few days elapsed from the time the patient noticed the acute attack until he came to the hospital for treatment. In simple acute cases the picture is uncomplicated by other activating agents of disease. The observations are easily made, and the symptoms are readily attributed to the single infective agent. These cases are also easily studied from the temperature graph.

Chinese cases are not so readily reduced to simple formulas. Granted that acute attacks of broncho-spirochætosis are not uncommon among the Chinese, the fact that the patient in many communities comes to the hospital as a last resort means that the case has run a considerable course, and has probably recurred several times before the physician has an opportunity to observe and treat it. The temperature in such chronic cases is lower and less regular than in acute cases. When the primary infection is pulmonary tuberculosis, both temperature and pulse are erratic, and remain irregular after the spirochætes disappear from the sputum. In other words, relief from the spirochætosis does not appreciably simplify the picture.

In acute broncho-spirochætosis, arsenicals injected intravenously give immediate relief. The fever drops, the pulse becomes regular, and the respiration normal. This important improvement is obtained from the initial dose, but ordinarily a second and, perhaps, a third administration are necessary for recovery. Bloedorn and Houghton used 0.6 grm. neoarsphenamin as an initial dose, followed by 0.5 grm., and then by 0.9 grm., repeated at weekly intervals. The first three injections were apparently necessary for recovery, although immediate administration of the arsenical on admission to the hospital, instead of two weeks later, might have reduced the amount of treatment necessary. In the Chinese cases, in spite of the chronic nature of the disease, arsenicals are specific and relatively rapid in the spirochæticial properties. Wylie gave an initial dose of 0.45 grm., and a second and third dose of 0.6 grm. each. A similar result was obtained for a Wuchang case, although the amount of neoarsphenamin was slightly larger. The temperature drops almost immediately after each injection, and is not followed by chills and sweats as when complicated by pulmonary tuberculosis. It remains nearly normal after the second dose, although the spirochætes do not usually disappear until some time later. Furthermore, there is usually a marked general improvement. The effect of this spirochæticide on the disease, even in an aggravated

chronic stage, apparently meets Manson-Bahr's objection that the causal relationship of *S. bronchiale* to the bronchial infection which it is found has not been proved.

In tuberculous infections the administration of arsenicals eliminated spirochaetes from the sputum, but did not materially relieve the patient. Temperature and irregular pulse persisted, while no bodily improvement was noted.

The administration of potassium iodide, sodium cacodylate and other therapeutic agents has been found valuable in broncho-spirochætosis, but per oral treatments do not have such specific properties as does the intravenous administration of arsenicals. Single doses of the latter alleviate, but apparently a cumulative effect is required for killing the spirochæte.

A most interesting phase of the study of broncho-spirochætosis is the blood picture. In all cases on record there is a reduction in red cells and a reduced hæmoglobin percentage. The leucocytes may be either reduced, increased, or normal. In one of Chalmers' and O'Farrell's cases, an Arab, the red cells numbered 3,648,000 per cm. during the attack, and 1,400,000 per cm. during the interval between attacks, with 80 per cent. hæmoglobin during the attack and 100 per cent. in the interval. There was a marked leucopenia, 2,719 per cm., with eosinophilia 2.6 per cent. of the total.

Nolf's Case 2, the only one of his histories with a complete leucocyte picture, showed a slight leucopenia (from 4,400 to 4,800), with 1 per cent. eosinophilia.

The Chinese cases reviewed vary as to the red count, but all show a reduction in the number of cells and in the percentage of hæmoglobin. One case shows a leucopenia (5,000), one case is only slightly above normal, while three cases show a leucocytosis. In each case the picture approaches normal with treatment. Of greater interest, however, is the grouping on the basis of the eosinophils. With tuberculous complication the eosinophile count, as observed, is less than 1 per cent. In the other three cases (simple infection) eosinophilia is extremely high (from 12 to 20 per cent.). This high percentage is reduced after treatment. It seems worth while, therefore, to inquire into the possible value of the eosinophile index as a means of ascertaining whether broncho-spirochætosis, as determined by detection of the spirochæte in the sputum, is a simple infection or constitutes part of a more complicated picture.

If one regards all varieties of spirochaetes of the respiratory tract (exclusive of the mouth) as *S. bronchiale*, but capable of different manifestations, the organism must then be considered as highly adaptive. However, Nolf's organism differs considerably from the typical agent of broncho-spirochætosis both in structure and in the effect on the host. It seems probable, therefore, that it belongs to a different group. There yet remain those types causing rhinitis, those with bronchial and lobar involvement, and those with only bron-

chial infection. There is also the record of bronchial spirochætosis with pleural involvement (Mason). It seems possible that careful examination will reveal all of these several types in China.

In cases that have been called to my attention the spirochaetes are more readily demonstrated in subacute cases than in chronic ones. Furthermore, there is some evidence to support the view that they can be recovered more easily from mucopurulent sputum several hours after an attack of hæmoptysis than in the blood-streaked sputum.

While the records from China cited here are incomplete and show the need of further observation of the disease in other centres in China, and to more thorough study of both the clinical and laboratory evidence of the infection. Such study is especially important in view of the widespread incidence of pulmonary tuberculosis in China. Detection and treatment of simple infection with bronchial spirochaetes will not only bring immediate relief to such cases, but will reduce the amount of routine observation and diagnosis in suspected tuberculosis patients who do not react to tuberculin.

Current Literature.

INDIAN MEDICAL GAZETTE.

Vol. LVII, No. 9, September, 1922.

Some Economic Aspects of Bengal Malaria (C. A. Bentley).—Attention has already been drawn to the fact that a serious decline of population indicates that a definite change has come over the affected area; the effects of such a change are not limited to man, but are certain to exert a very marked influence also on both the flora and fauna of the locality, resulting in an increase in certain directions and a decrease in others, and many of the increases and decreases are of special importance to man from an economic standpoint, affecting as they do the question of available food supply very greatly.

The most prominent and best recognized change in relation to fauna is to be seen in the great increase of malaria. Comparison of a map showing the areas suffering from a decline of population, with another showing the relative prevalence of malaria, prove that there is a rough correspondence between them. Depopulation is, therefore, generally associated with intense malaria. Evidence points to the fact that in areas in which the human population is declining, malaria has increased very greatly during the last sixty years.

Taking into consideration the broad fact that only 58 and 60 per cent. of the cultivable area is under cultivation in Central and Western Bengal respectively, it would appear, in view of the marked decay of population that has taken place in the former areas, that some climatic change has occurred which has affected the flora of these areas to such

an extent as to seriously diminish the food supply of the people.

The Problem of Kala-azar (F. P. Mackie).—The author, writing from Madras, is of the opinion that great caution should be taken in diagnosing kala-azar, which may be achieved in several ways, by clinical examination and by the microscopic examination of the blood among others. In the first method, clinical examination, it is easy to arrive at the diagnosis in typical cases, but those that are not typical provide a large margin of error. The author is chary of diagnosing or excluding kala-azar on clinical grounds alone, and for purely clinical records he divides cases into typical, probable, suspicious and doubtful, but no case is admitted to statistics in any scientific paper on clinical ground alone. The presence of the parasite is the only true criterion of the disease.

The Causation of Epidemic Dropsy (Hugh W. Acton).—The disease affects the Bengali Hindu community, whose diet consists mainly of rice.

The age incidence shows that the disease is dependent on the quantity of rice consumed by the individual. The peculiar distribution amongst the middle classes of the Bengal Hindus, whose main article of diet consists of seasoned rice, indicates that the poison is formed during the seasoning process.

The seasoning is probably due to bacterial invasion of the fruit and is more apt to occur in polished rice, where the fruit is injured during the milling, and during the monsoon months, owing to temperature and humidity. The high price of foodstuffs leads to the hoarding of rice in hot, damp godowns, when the decomposition products are allowed to go still further, and give rise to toxic bodies.

The aetiological evidence distinctly incriminates seasoned rice, which, if allowed to over-ripen, gives rise to certain poisons causing epidemic dropsy. The cause and prevention of the disease are obvious, viz., the elimination of seasoned rice from the diet.

Reports of Societies.

AN informal meeting of the Tropical Diseases Section of the Royal Society of Medicine was held on Monday evening, December 4, at 8.30 p.m., in the Barnes Hall, 1, Wimpole Street.

The President, Sir LEONARD ROGERS, gave a short address on the world distribution of leprosy, illustrating his remarks with the epidiascope.

Professor R. T. LEIPER exhibited cinematograph films of British Guiana: its people, natural history and scenery. The films were lent by the Government of the Colony, and served to acquaint the audience with an important and interesting Colony not so well known as it deserves, and at the same time to illustrate the itinerary of Dr. Leiper's expedition of 1921

The A. J. CHALMERS Library was open for inspection, and Mr. Powell, Librarian of the R.S.M., was present to show the interesting and valuable collection, which includes a good copy of the first printed edition of Celsus.

Dr. ALDO CASTELLANI exhibited a series of cultures and drawings illustrating the rôle played by "fungi" in tropical medicine.

Dr. BROUGHTON ALCOCK showed microscopic specimens of intestinal spirochaetes.

Dr. ARTHUR POWELL showed photographs of clinical subjects, including two syphilitic rashes simulating very closely variola, and some slides illustrating a useful and permanent method of mounting mosquitoes in celloidin. The specimens were shown over ten years ago at the Pathological Society and are still in excellent condition.

Other medical exhibits of tropical interest included specimens lent by Dr. Leonard Dudgeon, C.M.G., C.B.E., and Dr. J. C. G. Ledingham, C.M.G., F.R.S.

Over seventy Fellows, members of the section, and their friends were present at the meeting.

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At a laboratory meeting of this Society, held on November 16 at the London School of Tropical Medicine, Endsleigh Gardens, presided over by Sir Percy Basset-Smith, the following demonstrations were given:—

Col. A. Alcock (I.M.S., retired): *Mansonia* larvæ; termites' nest and queen termites; Formosan crab, supposed intermediary host of the lung fluke (*Paragonimus westermani*); Indian cobra; scorpions, male, female and young.

Col. S. P. James (I.M.S., retired): Eggs of some English culicines—deposited singly, and not, as commonly quoted, in raft formation.

Squadron-Ldr. H. E. Whittingham (R.A.F.M.S.): The life-history of *Phlebotomus papatasi* and its maintenance in captivity, and reference to the transmission of the virus of sand-fly fever from the adult fly to the succeeding generation, and thence to human beings.

Dr. A. C. Stevenson: *Filaria loa* in *Chrysops dimidiata*. The well known work of Dr. A. Connal and Mrs. S. L. Connal on the intermediary rôle of *C. dimidiata* as host of *F. loa* was illustrated by slide specimens showing the cycle of the filaria in the fly at intervals of forty-eight hours to nine days after its infection.

Filarial embryos after migration through the stomach wall were demonstrated in sections of the fly, lying in the fat body adjacent to the eye, in the thoracic muscles and abdomen, and in the final specimen, on the tenth day, filarial larvæ were seen escaping from the labella.

The further stage of infection by *F. loa* in man was shown by Dr. P. H. Manson-Bahr in fresh

blood preparations taken at 5 p.m., showing the active *Microfilaria diurna*. The patient, an Englishman, had been infected in West Africa in 1916, when he developed Calabar swellings. In 1919 no microfilaria had yet been seen in his blood. Sir Patrick Manson, who saw him then, foretold the appearance of embryos in the circulation in three years' time. That forecast had recently been accurately fulfilled, as the blood now demonstrated.

Sir Percy Bassett-Smith, as a further instance of long incubation between the date of original infection by *F. loa* and the demonstration of microfilaria in the blood, quoted the similar case of a marine infected in the Cameroons in 1915 and developing Calabar swelling, but only lately showing *M. diurna* in the blood.

Dr. Manson-Bahr also showed specimens of intestine with extensive ulceration due to sprue.

Mr. Cecil Hoare: The life-cycle of *Trypanosoma melophagium* in culture, in the blood of the sheep, and as developmental forms in the midgut of the sheep-*ked*—*melophagus ovinus*—the intermediary host of the flagellate.

Drs. J. G. Thomson and A. Robertson: Stages in the development of *Trypanosoma cruzi* (the cause of Chagas's disease or American trypanosomiasis in Brazil and Venezuela) in its intermediary hosts, the bugs, *Rhodnius prolixus* and *Cimex lectularius* and in the rat experimentally infected by intraperitoneal injection of the infected dejecta of the insect hosts.

The insects shown had been bred in the laboratory and artificially fed on a young rat, which retained infection for life. *C. lectularius*, one of the hosts, was capable of carrying infection for many months. The microscopical specimens included smears of the insects' dejecta showing trypanosome forms; blood films of the rat infected with trypanosomes; and sections of the brain and heart muscle of the rat showing the metacyclic stage of *T. cruzi* in large numbers.

Dr. Thomson also demonstrated the presence of oöcysts, 40 microns in diameter, of *Eimeria oxy-spora* in the faeces of a patient attending the Ministry of Pensions' clinic. Only two other cases of infection by this rare protozoon had previously been reported, one by Professor Dobell in 1919, the other by Dr. Broughton Alcock and himself in 1921.

Lt. H. Marrian Perry (R.A.M.C.): The developmental stages of the freshwater mollusc, *Bullinus contortus*, the invertebrate host of *Schistosoma hamatobium*.

The living specimens of the mollusc and its ova had been collected at El Mar near Cairo, and had survived transit to England.

There were shown the naked-eye appearance in water of the jelly-like sacs containing twenty-four to thirty ova, and the developing ovum as seen under the microscope.

Development occupied twelve days at 22° C. before hatching of the young mollusc, which did not reach full size until two or three months.

Medical News.

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EXAMINATION LIST. DECEMBER, 1922.

Faculty of Medicine.

Diploma in Tropical Medicine: M. J. Cohen, M.B., Ch.B.; A. C. Crawford, M.B., Ch.B.; C. M. Gracias, M.B., B.S.; W. A. Lethem, M.C., M.D.; S. D. Rieley, L.R.C.P., M.R.C.S.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT. 70TH SESSION. SEPTEMBER-DECEMBER, 1922.

Bomford, T. L. (Major, Indian Medical Service), Distinction and "Duncan" Medal; Benson, W. T. (Dr.), Distinction; Covell, G. (Captain), Indian Medical Service, Distinction; Hamilton, W. Heywood (Lieut.-Col., Indian Medical Service), Distinction.

Passed: Richardson, Miss B. (Wesleyan Mission); Gregory, Miss H.; Sharp, C. J. E. (West African Medical Service); Hewat, H. A. (Squad-Leader, Royal Air Force); Pandit, C. J.; Chand, H. (Captain, Indian Medical Service); Karandikar, W. G.; Nain, Kenwal (Kashmir Medical Service); O'Connor, F. W.; Lightbody, W. F. H. (Department of Health, Palestine); Holgate, M. J. (Major, Indian Medical Service); Vakil, F. R. (Captain, Indian Medical Service); Dasgupta, B. C.; Calder, C. A. (West African Medical Service); Le Vieux, B. T.; Cauchi, J. (West African Medical Service); Surveyor, J. M.; Warters, R. A. (Captain, Indian Medical Service); Whitelaw, R. D.; Lamb, P. W.; Ram, Chong Tak; Mackie, A. S. (Colonial Medical Service, Kenya Colony); Rupasingha, B. C. D. S. (Ceylon Medical Service); Murray, H. E. (Captain, Indian Medical Service); Garrod, H. J. J. (Indian Medical Department); Variava, K. E.; Brosius, C. F.; Somasundrum, J. E. (Ceylon Medical Service); Ingram, W. J. S. (Captain, Indian Medical Service); Fernando, A. C. A. (Ceylon Medical Service); Bulos, D. (Public Health Department, Palestine).

December 16, 1922.

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FURTHER OBSERVATIONS ON
TONSILLOMYCOSES.

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SOME time ago we published a paper on the comparative frequency of tonsillomycoses both in the tropics and in temperate climates. Recently we have come across several other cases and it may therefore be of some interest to deal further with the subject.

CHRONIC TONSILLOMYCOSES.

Chronic tonsillomycoses are generally due to fungi of the genus *Nocardia* (actinomycetes, streptothrix leptothrix and vibriothrix). It may perhaps be of advantage to give a few mycological data about these genera, all belonging to the order Microsiphonales, before giving the clinical description of the conditions they are associated with.

Microsiphonales Vuillemin 1912.

Definition.—Hyphae with the mycelium composed of fine bacilli-form byphae, usually $1\ \mu$ or less in diameter; generally gram-positive, when young and without distinct nuclei. Parasitic on man, animals and plants, or saprophytic.

Remarks.—This is a most interesting order, as its members are nearly always mistaken at first sight for bacilli. Hence the description of bacilli as the cause of so many fungal diseases due to these organisms.

One form of division into families is as follows:—

(a) *Nocardiaceae* Castellani and Chalmers, 1918.
Synonyms.—*Actinomycetes* Lachner-Sandoval, 1898;
Trichomyces Petrusky, 1903.

Definition.—Microsiphonales with a mycelium.

Type Genus.—*Nocardia* Toni and Trevisan, 1889.

(b) *Mycobacteriaceae* Mieshe, 1909.

Definition.—Microsiphonales without a mycelium.

Genus 1.—*Mycobacterium* Lehmann and Neumann, with the tubercle bacillus as a type.

Genus 2.—*Corynebacterium* Lehmann and Neumann, with the diphtheria bacillus as a type.

Most authorities place the *Mycobacteriaceae* under the *Schizomycetes* (bacteria).

Family *Nocardiaceae* Castellani and Chalmers, 1918.

Synonyms.—*Actinomycetes* Lachner-Sandoval, 1898;
Trichomyces Petrusky, 1903.

Definition.—Microsiphonales with a mycelium.

Type Genus.—*Nocardia* Toni and Trevisan, 1889.

Classification.—Until quite recently all the species of this order were considered to belong to one genus, i.e., *Nocardia* Toni and Trevisan, 1889; but Pinoy has made a subdivision, separating certain species into

another genus, which he calls *Cohnistreptothrix* Pinoy, 1911. In doing this, he points out that the original discoverers of actinomycosis, viz., Harz and Bollinger in 1877 and Rivolta in 1878, thought that they were dealing with one organism, but when cultures were attempted it became apparent that more than one organism was implicated. Thus Bostrom isolated a parasite which grew well aerobically, producing a dry membrane on the surface of broth and capable of growth at 20° C. on gelatine, but growing better on potato at 37° C. and forming chains of arthrospores. Inoculation into animals was, however, negative. This form is commonly called *Nocardia bovis* (Harz, 1877).

Wolf and Israel, on the other hand, obtained a parasite which only grew anaerobically and was not capable of growth at ordinary European air temperature. In broth it formed small granules or scales which fell to the bottom of the tube. These cultures often contained club-like forms, and the branching filaments broke up into bacillary or coccil-like forms. Inoculation of gelatine cultures into the peritoneal cavity of guinea-pigs produced actinomycosis. This form is commonly called *Nocardia israeli* (Kruse, 1896). Wright maintains that this organism is the true cause of actinomycosis and that *N. bovis* is merely a contamination, but this is not generally accepted.

There are, therefore, two distinct organisms which can cause actinomycosis in man and oxen, viz., *N. bovis* (Harz, 1877) and *N. israeli* (Kruse 1896), but the difference between them is considerable; and therefore Pinoy has separated off the latter and its allies from the former and has founded the new genus *Cohnistreptothrix* Pinoy, 1911. The name is derived from the fact that in 1874 Cohn described a fungus in lachrymal concretions under the term *Streptothrix farsteri*, which was considered to be a *Nocardia* and is now one of the species of Pinoy's *Cohnistreptothrix*. These two genera are distinguished as follows:—

(a) Grows aerobically, easy of cultivation, and producing arthrospores: Genus 1, *Nocardia* Toni and Trevisan 1889.

(b) Grows best anaerobically, but can often grow aerobically, difficult of culture, and not producing arthrospores: Genus 2, *Cohnistreptothrix* Pinoy 1911.

A few words may be added on certain filamentous vegetal organisms on the classification of which there is much discussion, viz., organisms of the genus *Leptothrix*, of the genus *Cladothrix*, of the genus *Vibriothrix*.

Genus *Leptothrix* Kutzinger, 1843.

Definition.—Filamentous fungi with long, very thin mycelial threads, with no capsule or only a very delicate one; non-branching non-septate, generally non-cultivable.

Type Species.—*Leptothrix maxima* Miller.

The following species have been described:—

Leptothrix maxima Miller, 1882.

Synonym.—*L. buccalis maxima* Miller. Long thin filaments, unsegmented, or with very long segments.

When treated with iodine and dilute sulphuric acid gives a blue granulose reaction. Has not been cultivated.

Leptothrix innominata Miller, 1882.

Morphologically identical with *L. maxima*, but when treated with iodine and dilute sulphuric acid does not give a blue reaction. Has not been cultivated.

Leptothrix racemosa Miller 1882.

Filaments somewhat thicker than those found in the two preceding species. On staining shows a peculiar beaded appearance. Has not been cultivated.

Leptothrix placoides Dobrzyniecki.

Very long thin filaments, Gram-positive, non-motile. Gelatine liquefied. Growth on agar very slow; produced very hard granular colonies. Isolated from human mouth by Dobrzyniecki.

Leptothrix filiformis Flexner, 1896.

Synonym.—*Bacillus* (*Leptothrix*?) *pyogenes filiformis* Flexner, 1896. Isolated by Flexner from a rabbit. Is non-motile, of difficult cultivation, pathogenic.

Leptothrix vaginalis Donne, 1885.

Found in vagina of women and animals.

Genus *Cladothrix* Cohn, 1875.

Definition.—Filamentous fungi with mycelial threads very long, thin, showing pseudo-branching. The only well-known species is *Cladothrix dichotoma* Cohn.

Cladothrix dichotoma Cohn, 1917,

Long, thick mycelial threads straight or slightly undulating. They are not dichotomous, as the name would suggest; it is merely a case of pseudo-branching. The organism can be cultivated on ordinary laboratory media, forming on agar a brownish, wrinkled, tough, membranous layer, very adherent. The medium may become stained, slightly brownish. The organism is found often in waters. We have found it, or a very similar species, in an ulcer of the foot in association with many other organisms.

Genus *Vibriothrix* Castellani, 1917.

The mycelial articles are of very different shape: bacillary, vibrio-like, spirillum-like, at times club-ended. Globular or pear-shaped bodies of very variable size may be present. Gram-negative, not acid-fast. The organisms belonging to this genus are generally motile. Cultivable on ordinary media.

Type Species.—*Vibriothrix zeylanica* Castellani, 1910.

Synonyms.—*Spirillum zeylanicum* Castellani, 1910; *Vibrio zeylanicus* Castellani, 1913; *Bacillus zeylanicus* Castellani, 1913; *Vibriothrix zeylanica* Castellani 1917; *Spirobacillus zeylanicus* Castellani, Spagnolo, and Russo, 1918.

Remarks.—Very polymorphic organism, vibrio-like, bacillus-like, and undulating forms being often found in the same preparation. Very small, medium size,

and occasionally large roundish bodies are at times observed, and club-like forms may also be present.

The organism is motile, Gram-negative, not acid-fast. Easily grown on ordinary media. On potato the growth is often of a reddish colour. In broth there is often a pellicle; preparations from the fluid medium generally show a predominance of vibrio-like or bacillary forms, while in the pellicle, long undulating forms are often found. On MacConkey's medium the colonies are white, and somewhat resemble those of the typhoid-dysentery group. The organism does not ferment any of the usual laboratory carbohydrates or alcohols: glucose, levulose, galactose, maltose, lactose, saccharose, mannitol, dulcitol, raffinose. There is, in fact, frequently a production of alkalinity. Milk is not clotted and is rendered alkaline, and certain strains after several weeks may induce a certain degree of peptonization. The great majority of strains are non-pathogenic to rabbits and guinea-pigs.

The germ was first isolated by Castellani from cases of dysenteric enteritis in Ceylon, and has recently been observed by the same author and by Spagnolo, Russo, Taylor, Douglas, and Ghiron, in Europe.

The germ is found in great abundance in a number of cases of dysentery, while it seems to be rare in other conditions; it is very doubtful, however, whether it can really become pathogenic, Castellani having found it also in cases in which the typical Shiga-Kruse bacillus was present. It may, perhaps, be considered to be a so-called "noso-parasite" similarly to what is the case with certain species of proteus found in cholera, in typhus fever and other conditions.

An organism very similar to *V. zeylanicus* has been found in cases of granular mycosis of the tonsils.

GRANULAR MYCOSIS OF THE CRYPTS.

The affection, which is not new, but which is little known, runs a chronic course and is not painful. The patient often does not come to consult the doctor because of a sore throat, but because of the unpleasant odour of the breath. On examining the throat small whitish-yellowish spots will be seen on the tonsils; these spots are in reality the surface portion of the granules contained in the crypts, and may be extracted with more or less ease. These bodies when crushed emit a very offensive odour; under the microscope they are seen to consist of masses of nocardia-like organisms, at other times of masses of leptothrix and vibriothrix; in certain cases both nocardial fungi and leptothrix are seen as well as various bacteria, and even protozoa such as amœbæ and flagellates. The *Nocardia* fungi present are very difficult to grow. After several years the masses in the crypts may become calcified, and real calculi may be formed, which sometimes form the starting point of some very severe inflammation.

Illustrative Case.—Mrs. N., European, aged 28, married, very good general health, does not complain of sore throat, but is greatly distressed, suffering from severe *fetor oris*, which is apparently the cause of

FIG. 1.

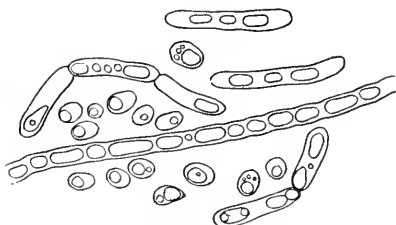
*Monilia tropicalis*: direct from the lesions.

FIG. 2.

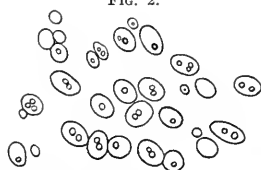
*Monilia tropicalis*: preparation from a glucose-agar culture.

FIG. 6.

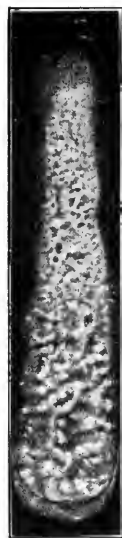
*Oidium asteroides*.

FIG. 5.

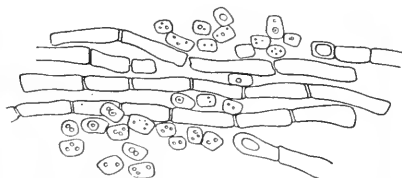
*Oidium asteroides*: from a glucose-agar culture.

FIG. 7.

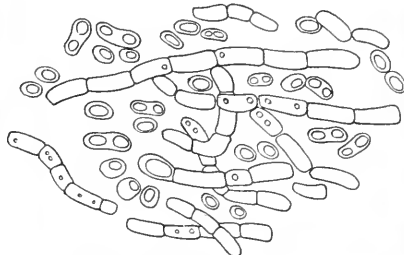
*Oidium rotundatum*. from a culture.

FIG. 3.

*Monilia tropicalis*: glucose-agar culture.

FIG. 3.

*Hemispora rugosa*: glucose-agar culture.

FIG. 4.

*Monilia zeylanica*: glucose-agar culture.

FIG. 9.

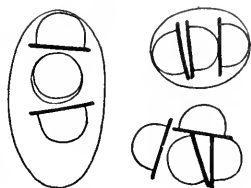
*Willisia* ascospores.

FIG. 10.

Tonsillomycosis due to *Hemispora rugosa*.

some estrangement with her husband. On the surface of the tonsils several whitish-yellowish spots are seen. On further examination one sees that they are small nodules easily removed from the crypts. The microscopical examination shows masses of a filamentous fungus. Attempts at cultivating it failed. All the nodules were extracted and applications of glycerine of borax ordered. The result has been very satisfactory.

TONSILLO-ACTINOMYCOSIS.

Primary actinomycosis (nocardiasis, cohnistreptothricosis) of the tonsils is rare. Most of the cases are of the yellow or white type; generally only one tonsil is affected. The tonsil is much enlarged and contains one or several small abscesses which on bursting discharge pus containing the typical yellow or white granules due to fungi of the genus *Nocardia* and *Cohnistreptothrix*. One of us observed in the tropics a case with black granules due to *Nocardia nigra*. Perry and Potter have recently thoroughly investigated a case of tonsillo-actinomycosis in this country.

ACUTE AND SUBACUTE TONSILLOMYCOSES.

Acute and subacute tonsillomycoses are in our experience comparatively common.

The following is an aetiological classification of these conditions.

(1) Due to fungi of the genus *Monilia*, tonsillo-moniliasis.

(2) Due to fungi of the genus *Saccharomyces*, tonsillo-saccharomyces.

(3) Due to fungi of the genus *Cryptococcus*, tonsillo-cryptococcosis.

(4) Due to fungi of the genus *Oidium*, tonsillo-oidiosis.

(5) Due to fungi of the genus *Willia*, tonsillo-williasis.

(6) Due to fungi of the genus *Hemispora*, tonsillo-hemisporosis.

Without entering into too many botanical details, it may be of practical advantage to give briefly certain characters of the above genera.

Genus *Monilia*, Persoon, 1797. — The original definition by Persoon is "Stipitata aut effusa hyssoides, fila moniliformis articulata," and Saccardo and other botanists state that these fungi are characterized by the sporophores being simple or sub-simple, and producing by constriction at the extremities a chain of large lemon-shaped conidia, often provided with a disjunction apparatus. No asci and no ascospores are present. The general tendency at the present time, however, thanks to the work of Pinoy and Vuillemin, is to extend the term "*Monilia*" so as to include all those organisms of the family Oosporaceae Saccardo 1886, the vegetative body (thallus) of which in its parasitic life (*in situ*, in the lesions) appears as a mass of mycelial threads and free budding forms, some of the mycelial filaments being long and branched, and of rather large size, and often presenting arthrospores. In the saprophytic life (cultures on the usual solid laboratory media) mostly roundish or oval budding yeastlike cells are seen, while mycelial filaments are very scarce or absent,

and when present they are rather short and consist only of a few short articles. *Monilia* fungi very often ferment glucose and other carbohydrates with production of gas. From a practical point of view these fungi are characterized principally by the following features: In their parasitic life in the human lesions the vegetable body (thallus) is composed of mycelial threads of rather large size showing arthrospores and numerous free, oval, or roundish budding yeast-like elements; in cultures, especially on solid media, mostly roundish or oval budding cells are seen, while mycelial filaments are scarce or absent. Asci and ascospores are absent.

For practical purposes monilias may be conveniently classified according to some of their biochemical characteristics as follows:—

(1) Production of gas in glucose only—*Monilia balaenica* Cast. group.

(2) Production of gas in glucose and levulose only—*Monilia krusei* Cast. group.

(3) Gas produced in glucose, levulose and maltose—*Monilia pinoyi* Cast. group.

(4) Gas produced in glucose, levulose maltose and galactose—*Monilia metalondinensis* Cast.

(5) Gas produced in glucose, levulose, maltose and galactose—*Monilia tropicalis* Cast. group.

(6) Gas produced in glucose, levulose and saccharose—*Monilia guillermondi* Cast. group.

(7) Gas produced in glucose, levulose, saccharose, galactose and inulin—*Monilia macedoniensis* Cast. group.

(8) Gas produced in dextrin in addition to other sugars—*Monilia pseudolondinensis* Cast. group.

(9) Gas produced in lactose in addition to other sugars—*Monilia pseudotropicalis* Cast. group.

(10) Absence of gas fermentation in any sugar—*Monilia zeylanica* Cast. group.

Genus *Saccharomyces*, Meyen.—The characters of these fungi are identical with those of the genus *Monilia*, except that asci and ascospores are present in old cultures.

Genus *Oidium*, Link. (*sensu stricto*).—This genus is morphologically closely allied to *Monilia*, but mycelial threads are much more abundant both in the lesions and in the cultures, and budding yeast-like cells are rare. Fungi of this genus may occasionally induce an acid fermentation, but never produce gas. There is no doubt that the original thrush fungus, *Oidium albicans* Robin, 1895, is not an *Oidium* but a *Monilia*.

Genus *Willia* Hansen, 1904.—*Saccharomycetaceae* with ascospores of a peculiar bowler-hat like shape. Fungi of this genus as a rule do not cause alcoholic fermentation, but often produce various ethers, the cultures often presenting a pleasant fruity odour.

Genus *Hemispora*, Vuillemin.—The mycelium is very abundant. Some mycelial hyphae become differentiated, forming terminal ampulliform structures called "protoconidia." The protoconidium after a time divides into several segments called "deuteroconidia," which are the true reproduction spores.

CLINICAL SYMPTOMS.

Tonsillomoniliasis.—The onset is generally abrupt with general malaise, fever, and difficulty in swallowing.

On inspection of the throat, in most cases, the tonsils are seen to be covered with creamy-white patches which at times extend to the soft palate, the pharynx and the larynx. Diphtheria is often suspected, but the microscopical and cultural examination of the patches clears up the diagnosis. One of us, however, has seen cases of mixed infection, diphtheria and moniliasis in the Tropics. The prognosis is generally favourable, but not always. The treatment consists in local applications of glycerine of borax, and, most efficacious, a carbolic or a chlorine spray. Small doses of phenazone or aspirin may be given internally.

ILLUSTRATIVE CASES.

Case 1.—History: On August 5, 1921, Pensioner N. suffered from tonsillitis with temperature 102° F., rapid pulse and prostration. On the tonsils and fauces there was a white, easily detached, membrane. Neither in the direct smear nor on the culture were diphtheria bacilli found. In the direct smear, made at the bedside, were a large number of *Monilia*. From cultures on Loeffler's medium and glucose-agar, *Monilia* was grown at 37° C., and isolated in pure culture. The patient made a good recovery after the exhibition of a chlorine gargle. No antitoxin was given.

Biological Reactions.—The *Monilia* isolated gave the following reaction: (1) Glucose: A and G; (2) leuculose: A and G; (3) maltose: A and G; (4) galactose: A and G; (5) saccharose: nil; (6) lactose: nil; (7) inulin: nil; (8) litmus milk: nil.

The *Monilia* biologically corresponds to *Monilia metalondinensis* (Castellani, 1916).

Intravenous inoculation of isolated *Monilia*. An emulsion of the *Monilia* was made from a glucose agar slope and 1 c.c. of a white opaque emulsion was injected into an ear vein of a rabbit. In five days' time the animal died and cultures of the *Monilia* were obtained from the heart blood, lungs, liver, spleen and kidney.

Naked-eye appearance of the organs: In the lungs there were areas of congestion but there was no pneumonia. Both kidneys were greatly enlarged. The capsules stripped readily and showed the surface white and granular. On section the cortex was whitish. This was due to white specks, none larger than a pin's head, closely set together. There were a few discrete specks in the medulla which otherwise showed little change to the naked eye. There was no change of note to the naked eye in other of the organs.

Microscopical appearance of the kidney: Microscopic sections showed the *Monilia* scattered throughout the substance of the kidney, but mostly in the cortex. A few lay singly but for the most part they were small groups and surrounded by small round cells. The glomeruli were not greatly affected. The convoluted and other tubules were distinctly degenerated and many of them crushed owing to the presence of groups of *Monilia*. The collecting tubules were less affected, but in their lumen were many red blood corpuscles and small white cells. The interstitial tissue was not increased. Between the tubules, how-

ever, especially in the medulla, there was a considerable amount of homogeneous matrix, staining pink with eosin. In the medulla the groups of *Monilia* were confined mainly to the periphery. In the clusters there was no caseation, no increase of fibrous tissue and there were no giant cells present.

The organism isolated from the heart blood of this rabbit was injected in a similar manner into another and in the same manner the second rabbit died in five days. At the autopsy the naked-eye appearances of the organs were in every way identical with those described above, as were also the microscopical pictures of the kidneys. The same *Monilia* was isolated from its heart blood and from the organs.

Case 2.—Cingalese girl, aged about 11, admitted to the Infectious Diseases Hospital of Colombo in 1910 with the diagnosis of diphtheria. There were white patches on the tonsils, uvula and soft palate. The temperature was rather high (102° F.); the pulse frequent and of low pressure. There was swelling at the angle of the jaw. The child developed symptoms of bronchopneumonia and died three days after admission. Antidiphtheria serum was given twice by the physician in charge of the hospital. The microscopical and bacteriological examination of the patches for the Klebs-Loeffler bacillus, carried out with the usual technic, serum-media, &c., being used, remained negative. No bacteria of any kind were seen in the specimens directly taken from the patches, but numerous mycelial and conidial elements of a fungus were present. On serum and glycerine agar media no colonies of diphtheria or other bacteria. The fungus had all the biochemical characters of *Monilia tropicalis* Cast.

Case 3.—A young European lady, aged 22, became suddenly ill with sore throat at one of the Colombo hotels. Her medical attendant suspected diphtheria, and called one of us to see her in consultation. When examined her temperature was 101° F., pulse 98; she complained of difficulty and pain in swallowing, both tonsils and uvula were covered with white creamy patches. Preparations made from the patches revealed an enormous number of yeast-like organisms and a few cocci, while no bacilli of any kind was present. This, of course, was sufficient to exclude diphtheria. On glucose agar tubes a fungus grew in pure culture with all the characters of a *Monilia*. This *Monilia* rendered milk slightly acid, and then decolorized it completely; it did not liquefy serum or gelatine. On serum it induced a narrow zone of black discoloration all round the growth.

Tonsillo-oidiosis.—The clinical symptoms are identical with those observed in tonsillomoniliasis. The odium so far found in these cases is *Oidium matalense* Castellani.

Illustrative Case.—European, aged 25, has been several years in Ceylon. In November, 1914, was taken ill with severe sore throat, difficulty in swallowing, and high fever (104° F.). When seen by one of us, twelve hours after onset, both tonsils were covered with a white exudation, but not the uvula. The microscopical examination and bacteriological examination showed absence of the diphtheria bacillus, while a fungus was grown with the botanical cha-

acters of an oidium. Further investigation showed it to be very similar to *O. matalense*.

Tonsillo-willasis.—The clinical symptoms are identical with those of tonsillo-moniiasis.

Illustrative Case.—An Indian girl, aged 14, in this country for her education got suddenly ill at the end of October, 1922, with high fever, severe sore throat and difficulty in swallowing. When one of us saw her both tonsils and the uvula were covered with creamy white patches. Microscopically no bacilli of any kind were present; instead numerous fungoid elements and a few cocci could be seen.

A cultural investigation was carried out; it was negative for *Bacillus diphtherie*. A fungus was grown with the general characters of the genus *Willia*. A determination of species was not attempted.

The patient got rapidly well on a treatment consisting of a local spray of 1 per cent. carbolic acid, painting with glycerine of borax, and internally a sodium salicylate mixture.

Tonsillo-hemiporosis.—The clinical symptoms are somewhat different from tonsillo-moniiasis. The onset is acute, but the general and local symptoms do not disappear so rapidly, the patches are not creamy, they are greyish-brown, or even greyish-yellowish, and are very resistant to treatment. The fungus found is a *Hemispora*, usually *Hemispora rugosa* Cast.

Case 1.—European planter, admitted to the Kandy Hospital on May 2, 1913. The illness had started two weeks previously. Temperature on admission 101° F. Complained of severe pains in throat and difficulty in swallowing. Flushed face; felt extremely weak and exhausted. Voice thick and nasal. Swallowing painful and difficult. Fluid regurgitated through nostrils. There was a profuse flow of saliva. The muscles of the neck were rigid, submaxillary glands enlarged and painful. The patient was unable to open the mouth wide. Tongue thickly coated and dry; soft palate swollen. Greyish membranes were present on the left tonsil, left anterior pillar and soft palate. Diphtheria antitoxin (2,000 units) injected the same day into the flank and spray of hydr. perox. prescribed. During the next four days the general condition improved, but the whitish-greyish membranes in the cleft between the left tonsil and the left anterior pillar were still very evident. Nine days after admission there was still a small whitish patch visible, but the patient felt quite well and was discharged the following day. In smears made from swabs taken for examination no bacilli were seen, a few cocci were present, and numerous large mycelial segments of a fungus. Serum tubes and glycerine agar were inoculated as usual, and gave the presence of mycelial threads; also several sugar agars. The serum and glycerine agar tubes did not show any growth of the diphtheria bacillus; instead there was a growth of a fungus with a peculiar crinkled surface which one of us had found previously in 1909 in a case of bronchitis. Being uncertain of its classification it was placed temporarily in the genus *Monilia*, and called *Monilia rugosa*. It was later sent to Professor Pinoy, of the Pasteur Institute, who, after a long botanical investigation, came to the conclusion that the organism

belonged to the genus *Hemispora*. The correct name of the fungus became therefore *Hemispora rugosa* Cast.

Case 2.—Mrs. N. B. came to consult one of us in September, 1921. She was complaining of sore throat which had begun three weeks ago and she had been treated with various gargles. There was a large greyish-yellowish patch on the right tonsil. The microscopical and cultural examination revealed the presence of hemispora. The local condition healed after repeated applications of iodine. It is interesting to note that soon after, she developed signs of bronchitis and the same fungus was found in the sputum.

Conclusion.—Mycotic affections of the tonsils are met with both in the tropics and in countries of the temperate zone. The chronic forms are comparatively rare, but the acute and subacute types are quite common and are generally due to fungi of the genera *Monilia*, *Oidium* and *Hemispora*. These conditions are of practical importance as they are often mistaken for diphtheria.

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SOME RESEARCHES ON RICKETTSIAS AND THE ÆTIOLOGY OF TYPHUS FEVER.

By LIEUT.-COL. FROILANO DE MELLO
(Professor of Parasitology, Faculty of Medicine, Oporto).

JACINTO DE SOUSA and AFFONSO GUIMARÃES.

INTRODUCTION.

In the beginning of this year a small epidemic of typhus exanthematicus gave us an opportunity to carry on some researches on the ætiology of typhus and other problems connected with rickettsias. Two of my students, MM. Affonso Guimarães and Jacinto de Sousa, were specially attached to this investigation, which could not be followed with further development by want of material, as the outbreak ceased in a short time. In this paper some points will be summarized about which definite conclusions were established. Drs. Basshave (London), da Rocha Lima (Hambourg), and Wolbach (U.S.A.), were kind enough to supply our laboratory with a very rich literature on the subject, and to them our best thanks are due.

RICKETTSIA BODIES IN THE BLOOD OF TYPHUS PATIENTS.

We have used many methods for this purpose, the best results being obtained with Giemsa Grubler or R.A.L. (one drop for 1 c.c.) staining the slide during two or three hours, after fixation of the frottis by absolute alcohol.

The slides were prepared from the blood taken either from the finger, or from an exanthematic patch on the skin. May-Grunwald followed by panchrome gives also good figures of rickettsia.

We examined the blood of eighteen patients, twelve gave positive results, some of them showing rickettsias in such a number that we can hardly conceive how, in the literature at our disposal, it is stated that the discovery of rickettsias in the blood of typhus patients is very difficult, almost impossible. A careful control has been made by ourselves and by Professor Salazar and his pupil, Miss Adelaide Estrada, either with normal blood, or with that of our patients, to arrive at the conclusion that we were not dealing with a mere contamination or some mistake in the technique.

In the small work we have done in Oporto we started with the study of the blood, and in some of the patients we found a micro-organism sometimes in such a number that one is undoubtedly inclined to consider it the agent of the disease—may we be allowed to emphasize this point, a direct proof we offer to those who support the rickettsian theory of typhus.

The agent found in the blood of our patients is extremely polymorphous, staining bluish pale with Giemsa Grubler, violet with Giemsa R.A.L., and a little paler with panchrome. The predominant form is of a coccobacillus with a light central zone resembling a pasteurilla; when the staining is very strong or the microbes very small the central zone is missing.

Nearly 75 per cent. of the organisms show this appearance and measure 0.5 to 1 micron \times 0.4 to 0.5 micron. The next form concerning its occurrence in the blood is a diplococcus surrounded or not by a light halo and measuring 0.9 to 1.1 micron. Some bacteridia with or without a deeply stained central granule and strong bipolar coloration are also found measuring 1.2 \times 1.4 micron. The agent may also assume the form of cocci, some of them small and isolated (0.3 to 0.5 micron) and others assembled in a diplococcus of reniform type (1 \times 0.9 micron), as well as a bacillary form with or without a light central zone, single or in diplo (1.5 to 1.7 \times 0.4 each element). More rarely we found a coryne-bacterium type, either haltere-like (1.5 to 1.7 \times 0.4 micron) or with one of the rods slightly enlarged and more or less club-shaped.

A careful study of the figures given by da Rocha Lima, Wollbach and others, enables us to identify our agent with *Rickettsia prowazeki*, as it has the same dimensions, morphology, structure and colorability described by these authors.

RICKETTSIA BODIES IN THE BLOOD OF TYPHUS CONVALESCENTS.

The second important point in our researches is the discovery of the same agent in the blood of some typhus convalescents. In our first case the blood was examined three days after the temperature reached the normal and thirteen days after the beginning of the disease. The analysis was positive, giving long coccobacilli, with bipolar staining (1 to 1.3 \times 0.4 to 0.5 micron) bacilli and diplobacilli, all showing the structure of rickettsian bodies. Systematic daily analyses were then made in order to deal with this point, to

which will perhaps be attached some new problems similar to those concerning the carriers in bacterial diseases.

The forms we have found here were of the same type as in Case 1 and some corynebacteria with three granulations (1.2 \times 0.3 micron). Eight convalescents have been examined, three being negative and five positive. The results are summarized in the following table:—

No.	During disease	Days of convalescence									
		1	2	3	4	5	6	7	8	9	10
1	?	?	?	+++	—	—	—	—	—	—	—
2	?	?	+++	+++	+++	++	+	+	—	—	—
3	+++	—	—	+	—	—	—	—	—	—	—
4	+	—	—	—	—	—	—	—	—	—	—
5	?	—	—	—	—	—	—	—	—	—	—
6	++	—	+	—	—	—	—	—	—	—	—
7	W.F.+	—	+	—	—	—	—	—	—	—	—
8	W.F.+	—	+	+	—	—	—	—	—	—	—

Legend: + rickettsia present, — absent;
W.F., Weil Felix reaction.

The number of cases is not large enough to authorize definite conclusions, but the fact to which we call the attention of researchers having a large material at their disposal, remains beyond doubt: in the blood of some typhus convalescents rickettsias are found even on the seventh day following the fall to normal of the temperature.

STUDIES ON THE INTESTINAL CONTENTS OF PEDICULUS VESTIS.

The intestinal contents of some body lice have been dissociated in a drop of normal saline solution dried at room temperature, fixed by absolute alcohol and stained by Giemsa Grubler or R. A. L. (one drop to 1 c.c.). As in the rickettsias found in blood, Giemsa R. A. L. gives a violet tone, Giemsa Grubler pale bluish. Some lice have been fixed for histological examination whose results will be communicated further on. The material that enables us to write this note is composed from:—

- Lice taken in Oporto from typhus patients.
- Lice taken from beggars in Oporto, where typhus gave a strong epidemic two years ago and a small outbreak at the time of our studies (lice considered suspect).
- Lice taken at Caminha, a town which has never had cases of typhus (normal lice).

(1) From the first series only six lice have been examined, four from one patient and two from another. Their intestines show a very abundant flora that can be morphologically classified in the following way (it is important to note that the different forms described here have been found in the same groups and must be considered as morphological variations of the same micro-organism).

- Cocci, 0.3 micron.
- Idem* but a little longer—0.4 \times 0.3.
- Diplococci, each element being of the last type or somewhat lanceolated.
- Coccobacilli with bipolar staining resembling

pasteurella, 0.5 to 0.7 × 0.3 or a little longer resembling bacteridia with a central unstained spore.

(e) *Idem* with a pale halo around, sometimes large enough to simulate a capsule.

(f) *Idem* but having in the centre one more deeply stained granule, resembling a small chromatic nucleus 0.7 to 1 × 0.3.

(g) Bacilli or diplobacilli with the same structure as type b.

(h) Large bacteridia with many granules situated either on the body or at the tips.

(i) Bacilli of diphtheroid type, either in haltere form or with granules on the body, some being very long, 2 × 0.2.

(j) Bacillus 2.5 × 0.3.

(k) Bacillary forms slightly incurved, either homogeneous or having a central granule.

All these forms have fundamentally the same structure, have been found in the same groups of micro-organisms, and can be considered as morphological variations of the same species that we have no doubt in classifying as belonging to the type actually named rickettsia.

We have also found some isolated forms that we are not able to classify as rickettsia, viz:—

(a) Large filamentous forms, six times longer than the pasteurella and with many granules spread on the body (in the excellent report of Wolbach similar forms are also described as rickettsia).

(b) Forms in Y, with granules.

(c) Large cocci, round or reniform, 0.6 to 0.8, homogeneous, violet coloration, or polychromatophyllous, with a pale bluish periphery zone and violet centre, single or in pairs, simulating giant gonococci.

(2) From the second series (suspect lice) eighteen have been examined. Their flora and the rate of infestation for each form are (only one was entirely free from microbes):—

	Per cent.
(a) Bipolar pasteurella, typical rickettsian form ..	77.0
(b) Capsulated diplococci, 0.3 to 0.5 ..	72.2
(c) <i>Idem</i> , the elements being larger ..	11.0
(d) <i>Idem</i> , of reniform type, 0.6 to 0.8 ..	44.0
(e) Capsulated coccobacilli, 0.5 to 0.3 ..	27.7
(f) Groups of cocci with a large halo measuring 1.2 to 3 microns ..	11.1
(g) Cocci without halo ..	16.6
(h) Cocci of staphylococcus type ..	11.1
(i) Large cocci, 0.8 to 1.1 ..	5.5
(j) Capsulated bacilli, 1.3 × 0.2 ..	49.8
(k) <i>Idem</i> , with a light central zone ..	5.5
(l) Bacilli without halo, 2.6 × 0.2 ..	22.2
(m) Bacteridia type subtilis 4.5 × 1 ..	11.1
(n) Diplobacilli with or without halo ..	49.8
(o) Bacilli of various sizes, with or without halo and showing either a central granule or a constriction on the middle ..	22.2
(p) Diphtheroid forms 1.8 to 3 × 0.3 to 0.4 ..	27.7
(q) <i>Idem</i> , with a halo around ..	38.8

From a very careful analysis of these lice we can say that their flora presents the same morphological variations as in the anterior series, but is much less abundant, and has never shown the micro-organisms assembled in groups of hundreds and hundreds, elements as in the intestinal contents of lice collected on typhus patients.

(3) From the lice collected at Caminha twenty-eight have been examined, twenty-five entirely free

from any micro-organism. The remaining have shown:—

	Per cent.
(a) Groups of pasteurella with bipolar rods, typical rickettsian forms, 0.5 to 0.8 × 0.3 micron ..	8.6
(b) Isolated pasteurella ..	14.4
(c) Groups of cocci intensely stained, single or diplo, 0.5 to 0.7 × 0.2 ..	10.8
(d) Capsulated diplococci ..	25.2
(e) Cocci of staphylococcus type ..	3.6
(f) Non-capsulated diplococci ..	7.2
(g) Reniform capsulated diplococci ..	7.2
(h) Isolated coccobacilli, without light central zone ..	14.4
(i) Capsulated bacilli ..	7.2
(j) Diplobacilli ..	3.6

The lice collected at Caminha (normal lice) are infested by a flora having not only the same morphological variations as in other series, but even assembled in groups of pasteurella, typical rickettsian forms whose morphology and dimensions are entirely similar to the rickettsia found by us in the blood of typhus patients. It is easy to say that we were dealing with *Rickettsia pediculi*; but it is not by the technique of frottis that one is able to make a differentiation between *R. pediculi* and *R. prowazeki*. From this study and till further elements based on the histological examination of the lice that we have fixed for this purpose, we will emphasize the following point: the *Pediculus vestis* collected in North of Portugal on typhic patients or on normal individuals show in their intestinal contents micro-organisms of the same morphological type. They are extraordinarily abundant on typhic lice, but in a small percentage of normal lice, the number, structure and morphology of the micro-organism are so similar to those of typhic patients that it is impossible to decide by the technique of frottis if we are dealing with *R. prowazeki*, *pediculi*, or some other.

RICKETTSIAN ELEMENTS IN THE INTESTINE OF NORMAL PHTHIRIUS INGUINALIS.

In the literature we have been able to consult, no reference has been found concerning the flora of *Phthirus inguinalis*. We have studied many Phthirii of Caminha. Their frottis stained by the same method have shown:—

	Per cent.
(a) Cocci, 0.4 to 0.6 micron ..	74.0
(b) Diplococci, 1.1 × 0.4 ..	12.0
(c) Chains of cocci having 3 to 4 elements ..	24.0
(d) Coccobacilli, isolated or assembled in groups, bipolar staining, typical rickettsian forms, 0.9 to 1.1 × 0.4 to 0.5 ..	90.0
(e) Bacillary forms, straight or slightly incurved, 1 × 0.4 to 0.5, having the same structure as the anterior type ..	24.0
(f) Corynebacterium type, club-shaped rods, 1.2 × 0.6, with or without a light central zone ..	24.0
(g) Bacilli, 0.9 to 1 × 0.4 ..	24.0
(h) <i>Idem</i> with bipolar staining and a central granule ..	12.0
(i) Large bacteridia, 1.8 × 0.8 ..	12.0
(k) Large roundish elements 0.8 to 1 micron, with the same structure as the anterior form ..	12.0

As we know well the morphological variations of the rickettsia found in the blood—the starting point of our studies—we are able to say that the forms a to i represent the polymorphism of the same species, and only the types j and k seem to belong to another species. The first group belongs to rickettsia: im-

possible to say for the present if this species of rickettsia is peculiar to *P. pubis* or a mere *R. pediculi*.

Further studies will be communicated to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DENGUE v. MALARIA.

By R. E. INGRAM-JOHNSON, L.R.C.P.Ed., &c., Colombo.

SINCE writing my paper on this subject, which appeared in the Journal of May 15, I have been endeavouring to find a reason other than clinical for my theory that dengue is antagonistic to malaria.

Immunity from certain diseases such as enteric fever is brought about firstly, as the consequence of some antibody in the blood, formed by the death of the organisms which produced the disease; and, secondly, artificially, by injecting a substance into the blood, formed from the cultivation and death of those organisms.

Presuming that my theory, that an attack of dengue renders a person immune from malaria is correct, of what nature is the substance that is formed in the blood after that attack? It is evidently not antagonistic to dengue itself, as the disease often recurs in a very short time. If, then, it is truly antagonistic to malaria, is it not at least possible that it is due to some modification of a malarial infection which has passed through the mosquito which has by its bite conveyed the infection of dengue? This is the point that I wish to endeavour to prove theoretically.

In the first place both malaria and dengue are mosquito-borne—malaria by *Anopheles maculata* and dengue by *Culex fatigans*.

Then dengue is only found in places where malaria exists, and then usually near the sea coast in warm climates. I am speaking of true dengue, with its double fever and double eruption. This being the case, one may assume that there is some affinity between the two diseases.

The parasite of malaria is a protozoon, and the "germ" of dengue has not been isolated, as it passes through any known filter and is ultra-microscopical.

The *Anopheles* mosquito, feeding on a person who is suffering from malaria, and in whom the parasites are active, and in the peripheral circulation, ingests a certain number of parasites which undergo a sexual life cycle in the walls of its stomach, and are injected into the human subject subsequently bitten, in an entirely different form from that which they had when the mosquito first ingested them, and, on their entry into the blood of their human host, they undergo an asexual life cycle, and cause an attack of malaria.

Now, suppose that a *C. fatigans* mosquito feeds on the same person at the same time as the *Anopheles*. It will ingest into its body probably a similar number of parasites. What becomes of these? Are they simply digested? Is it possible that in two species of insect so closely related the digestive apparatus is so strong in one, the *Culex*, that substances such as the malaria parasite completely disappear, whilst in

the other, *Anopheles*, they not only do not disappear, but undergo a sexual life cycle?

My own belief is that these parasites do not entirely disappear in the *Culex*, but instead of proliferating as in the *Anopheles*, they split up into ultra-microscopic granules, living organisms, which, on injection into human beings, are the cause of dengue. Of course, being ultra-microscopic, this theory is difficult to prove, but as it is certain that every *Culex* mosquito does not convey dengue by its bite, those that do convey it must have got the infection from somewhere in the first instance, and although *Culex* is known to convey dengue from one person to another, the sporadic cases of dengue that spring up from time to time, where there is no possibility of infection from another case, must have some other origin. As dengue only occurs where malaria is known to exist, it is more than probable that it is a disease which is caused by some modification of the malaria parasite which has passed through the body of the *Culex* mosquito.

An objection has been raised, that the malaria parasite being a protozoon, it is impossible that it could become some other form of organisms, but who can say what is possible in bacteriology?

I am indebted to my friend, Mr. E. Burgess, Acting Bacteriologist in Colombo, for showing me some wonderful modifications of *Bacillus typhosus* that he has obtained by cultivation in different media. Many of them are many times larger than the original bacillus from which they were cultivated, and have assumed strange forms and shapes, but all of them under treatment can be made to reassume their original size and shape, and from them can be cultivated the true *B. typhosus*. Another very interesting point, and one which bears on my theory, is that clumps of almost ultra-microscopical granules exude from some of these modifications. These can only be seen by very careful manipulation of microscope and light. They are held together by a barely visible plasma, and from these clumps also living *B. typhosus* can be produced, showing that these granules are living organisms, or that at any rate there are living organisms, though ultra-microscopical, contained in the clumps, even assuming that those that take a stain are dead. It is also known that such clumps of granules have the power of liquefaction of such organisms as the streptococci and staphylococci.

As with artificial media such changes can be wrought in the *B. typhosus*, is it not possible, or more than possible that in the stomach of the *Culex* mosquito, a natural cultivation medium, the malaria parasite may be broken up into minute granules, living organisms, which have the power to destroy the life, or at least prevent the proliferation of the malaria parasite in its original form.

In dengue itself the period of incubation is somewhat doubtful, but the high primary fever with the erythematous first rash only lasting one or two days, with the secondary fever and rash on about the fourth day, point to its being caused by a living organism which undergoes a specific life cycle, and not by a toxin. The fact that an attack gives no immunity

against a second attack shows that no antibody, as against dengue, is formed in the blood. Clinically speaking, I think there is little doubt but that an antibody is formed which is antagonistic to malaria, and therefore I put forward the theory that dengue is a modified form of malaria bearing the same relation to it as vaccinia bears to small-pox.

If then one could find some means of cultivating the dengue-causing granules, or whatever they may be, a serum could be produced which would give immunity from malaria. Dengue itself is such a very disagreeable and prostrating disease that although it is rarely fatal, people would shrink from it. Animals which are immune from malaria are also immune from dengue, so it is difficult to find any animal susceptible to the disease, from whose blood the necessary antitoxin could be procured.

Histology of Spleen in Infantile Kala-azar (E. E. Franco, *C. R. Soc. Biol.*, July, 1920, vol. lxxiii, No. 26).—The author describes types of cell found in the spleens of ten cases of infantile kala-azar. He is of the opinion that it is not the endothelial cells of the small blood-vessels or lymphocytes which have phagocytized the parasites, but other cells in the reticulum, the origin of which is traced.

Dissociation of Microbic Species. Co-existence of Individuals of Different Degrees of Virulence in Cultures of the Bacillus of Rabbit Septicæmia (P. H. de Kruif, Ph.D., *Journal of Experimental Medicine*, vol. xxxiii, No. 6, June, 1921).—Two types of organism have been shown to exist in cultures of the bacillus of rabbit septicæmia, recently isolated from spontaneous infections. One, *Microbe D*, grows diffusely in serum and plain broth, forms rather opaque, florescing colonies on serum agar, and is highly virulent for rabbits. These characters are retained throughout many passages in serum or plain broth. The other type, *Microbe G*, flocculates rapidly in fluid media, forms translucent, bluish colonies with little fluorescence, and exhibits extremely low virulence for rabbits. Like *Microbe D*, its distinguishing characters persist throughout many passages in artificial media. Two methods for the dissociation of these varieties from the parent culture have been described. The two types are morphologically indistinguishable and possess identical fermentation reactions.

Rabbits surviving inoculation with Type G are resistant to multiple lethal doses of Type D. The agglutination reactions bear out this suggestion of the antigenic identity of the varieties. Community of antigenic character is rendered certain by the results of absorption reactions. *Microbe D*, in contact with immune serum, flocculates well at 55°, but poorly or not at all at 37° C. *Microbe G*, on the other hand, agglutinates easily at both temperatures. *Microbe D*, after being carried through twenty-five passages in serum and in plain broth, retains perfectly its characteristics of diffuse growth and of virulence, in the plain as well as in the serum broth.

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SOMETHING TO BE SAID FOR THE EXHIBITION OF DRUGS IN THEIR NATURAL STATE.

ONCE more the subject of opium is being taken up by the lay press; and several medical men are declaring their opinions concerning its consumption. One medical man is stated to have given the opinion that

the members of the medical profession consume it more extensively than any other section of the community. If by this statement is meant that medical men are more addicted to the drug in the form of a debauch the writer does not believe; and we have no hesitation in publishing the absolute denial of the truth of such a statement. The writer who has as wide an acquaintance with medical men as the average has in the course of a long life known only two medical men who committed suicide by morphia, but not one doctor who was "addicted" to the drug as a debauchee, that is, became a slave to it.

Moreover, the writer has never known a doctor in practice who adopted the rule of withholding opium in some form altogether from his prescriptions when the drug was seriously indicated. He had, however, to camouflage on many occasions when he found it advisable to give the drug, so that his patient was not aware that it had been given. Women especially are apt to wax wroth if it is suggested to "give something" to ease pain or procure rest. They would "rather die than take drugs": by drugs, meaning opiates. Castor oil and opium are the two treasures of his armamentarium that are thus spoken of and perhaps the only two: one on account of its "vulgarity" and taste, the other because of its association with the drug habit. Opium, although regarded by, and declared by, our older teachers in *materia medica* as the gift of God to man, has no thankfulness extended to it in everyday circles in non-tropical sick rooms at all events.

The wave of feeling against "drugs," meaning opium to-day, is rising to so high a pitch that medical men are threatened with being deprived of the "greatest gift," and a whisper that Doctor So-and-so is very "fond" of giving drugs (opiates) will soon go round and his practice will suffer amongst the rich and poor alike. The newspapers have excited their minds against "drugs," the missionaries home from China and elsewhere tell the ghastly tales of opium fiends and their smoking dens, they are asked to support their societies to put down opium, until they will stand up against the doctor and defy him to give anything to soothe pain in their own children and prevent him administering drugs in their fetish against "God's gifts," and see their child die rather than lend themselves to such evil practices. By and by, and it is not far distant, the "cranks" will take up this matter with the same vehemence as they have done in the case of alcohol, and prevent opium being brought into the country and prevent any loophole for its use. The doctors will be prevented prescribing it, and lay themselves open to fines or punishment if they dare transgress. They have brought scientific research in this country to heel by promulgating anti-vivisection meetings and by anti-vaccination shoutings; they have sacrificed thousands of lives, they have sent their sons and their daughters into the world scarred by small-pox, sight lost by the pox destroying their eyes, gabbled nonsense in our public parks, condemning anti-diphtheric inoculations, and see their children die with the grim satisfaction that they have maintained their cause amidst great sacrifice and covered themselves with glory thereby.

Now that opium is controlled and the doctors must obey the laws under a penalty, they are bound: (1) to sign their names in full at the foot of their prescriptions; (2) to append their diplomas or degrees; (3) to give their residential address in full; (4) to give the patient's name in full; (5) to state the patient's address in full; (6) to declare that the prescription is "not to be repeated." Not only is the doctor thus penalized, but the chemist is watched carefully by authorities that they observe their instructions, which is amongst others to watch the doctor, to make inquiries as to the doctor's genuineness, &c., thereby not infrequently delaying the patient getting the relief from pain, &c., which demanded the doctor being sent for, and therefore urgent. The penalty for chemists is heavy. If the doctor writes out, say, two or three prescriptions on a single sheet of paper, and places on one side an opiate mixture, and on the reverse side a dose of salts, and signs his name on the last-named side with the proper sequelæ of qualifications, "not to be repeated," &c., that is, on the *side* on which the opiate is *not* written, he is liable to heavy fines, and a chemist having once to pay £25 or much more for so serious a transgression of law, becomes troublesome to the doctor who wrote the prescription, fidgety and super-sensitive to such an extent that he loses the doctor and the patient over the transaction. By whom is this phase of legislation watched and reported? It requires spies in numbers to see that this large traffic is supervised. It must mean that hundreds of men are employed in various ways over this piece of detective work, necessitating as it does, lawyers, officers of the Court of Law, police interference, and a whole army of extra Government employees.

Reduction of Government servants and of the staff of some offices is evidently not the keynote of this branch; the "axe" is defied, and the good done undiscoverable. The calculation of how much opium is allowed in a dose is difficult enough in all conscience; the excess of $\frac{1}{15}$ of a gr. of opium in each dose of a bottle of medicine is sufficient to prevent the patient getting the medicine for hours or even days it may be, and the chemist is rendered liable to fine or imprisonment in consequence. This seeming officiousness in supplying the public with medicine with qualified doctors and chemists to guard them is reducing dispensing to a burlesque, and opening the door to interference in medicine which will certainly increase until "the sluggard and scoundrels protection societies," as Carlyle dubbed the "trade unions," will control the doctors and the science of medicine, their schools and universities, and they will become tradesmen with the invariable accompaniment of strikes and curtailment of hours of labour, and such degrading accompaniment as we see the working man called to submit to by his tyrannical master in the shape of the leaders of the "sluggard and scoundrels protection societies" which he is content to support and to follow.

This interference with doctors and chemists is but the opening stage of the reduction of both to the position of tradesmen which in Russia is now dealt with by death to all who are on a higher platform

than their rulers for the moment, in their so-called humanitarian protection of the weaker members of the community, who require to be "guided, legislated for and protected."

Opium, by which is meant all its derivatives and associated drugs, has been used from time immemorial; now it is guarded and prevented to be grown or given by well meaning folk; and the people in England implored for money whereby to help to stamp it out; and the public who have got their fingers in the pie by such means as the 9d. for 4d. scheme of "National Insurance" is in the same engulfment to crush science and scientists and encourage psychology, the occult, and such brain waves which signify—nothing. And poor opium is stricken—the most useful drug we possess. Doctors have more than once declared that if only one drug is left to them in the world let that be opium. Malaria, that widespread scourge, the destroyer of more races than all other ailments combined, has been allowed to have its fling since it has practically ceased to be given for "fever." Quinine introduced into the Western world has attempted to drive opium from the Eastern in the treatment of malaria; yet malaria is not being driven out by quinine. It has its part in the great fight, but sanitation, sanitation and only sanitation is to do that. In many little nooks of the tropics sanitary work has shown what it can do, but the application is but infinitesimal, and the expulsion of malaria on a large scale not yet in evidence. In England, sanitation in the form of drainage practically freed the country from malaria in the early times of the last century. When Africa is drained malaria will disappear; that means more people on the Dark Continent; but the people cannot increase in sufficient numbers owing to the deaths due to malaria. That is the vicious circle we have to contend with. Malaria rampant, population insufficient; sufficient drainage and malaria less; increase of population.

It is a far cry to drain Africa, and in the meantime quinine and screening are our only stand-by. Opium has done its best in the two most populous and densely populated countries—well nigh half the human race—India and China. With quinine added to opium our armamentarium is fortified, yet few Europeans use it to-day systematically. During the flood of fresh medical men who found themselves treating malaria during the war, many condemned it as useless, and took to arsenic and other drugs. Some few learnt to combine them, but few did as their grandfathers did a hundred years ago in England; few—very few—added opium to their quinine and arsenic dosage, and their patients suffered accordingly.

The old English fever powder when malaria had full play, when there were as many big spleens in the fen country in England as there are in Sierra Leone or the Gold Coast to-day, the "Fever" pill, or powder, was universally used, and when wise practitioners used quinine, arsenic, and opium in combination. Mercury was given invariably before the pill or powder, so that the four potent drugs were co-existent in the body as the remedy for malaria.

Until sanitation—drainage—has removed the

swamps from Africa and elsewhere in the world malaria will continue.

In the meantime, men and women's lives have to be saved so that the African population may increase in order to allow of sufficient labour to be reared to drain the country. How? By the methods adopted in England, combined with the drugs they used to thwart malaria, by getting rid of the fetish that quinine alone is sufficient. As a matter of fact it was not quinine that did it in the first instance in South America, but an infusion of the cinchona bark of which quinine was only one ingredient. The modern chemist was not there to extract quinine and the original infusion was more than quinine. Just as opium is an original drug and not mere morphia, just as ipecacuanha root is not emetine, so cinchona bark has many adjuncts to the extracted quinine of to-day and "simples" have more adherents and consumers in tropical countries than the salts artificially prepared by the chemist. In the same way our food made with its primitive milling whereby the vitamins are left on the rice and not thrown away with the husk, nor the oat or wheat in former days refined to its great loss as an article of diet, so it would seem that wherever in the vegetable kingdom its products are of use to man, so the more we "improve" these products the less are they of use to mankind in health and disease. One drug one disease finds the world awry. Four thousand years ago we had what is now called Warburg's tincture with its three-and-twenty ingredients as compared with the single drugs of to-day, and of which single salts or extracts are used. The question will in time settle itself, but at the present neither as food nor drugs are we taking them as Nature sent them for our use.

The introduction of organo-therapy is a step in what many regard as the right direction. In our ordinary diet we have consumed since the earliest times in our so-called animal food every part of the animal, including the fat around the kidney, as suet, and thereby supplying our system with the ingredients of the suprarenal gland. The brain, with its pineal gland, &c., has formed one of the sweetbreads of our table; the thymus gland as the calf sweetbread, and the thyroid as a part of the "lights," have been consumed without a thought as to their function and therapeutic use. Consumed as they exist in the animal's body, they have unconsciously taken their part in the great scheme of organo-therapy before physiologists and chemists knew of their powers; and before chemical and physiological laboratories abstracted their potent ingredients, and doctors prescribed them in grains or fractions of grains, they were unconsciously used to nourish the body, and just as mosquito nets were used to keep off malaria infection before scientific proof of the exact part the mosquito played in the transmission of malaria, so many, if not all, the drugs we use to-day were used mostly as "simples," that is, before extracts, whether of vegetable or animal tissues, were in vogue. So there is something to be said in favour of preserving the tissues in which the more active ingredients of any drug are environed instead of separating them.

J. CANTLIE.

Annotations.

Balancing the Diabetic Diet (Soloman Strouse, M.D., *Journal of the American Medical Association*, vol. lxxix, No. 23, December, 1922).—The following simple procedure for balancing the diabetic diet is proposed:—

Protein equals 0.66 gm. per kilogram of body weight, or 0.3 gm. per pound.

Carbohydrate equals the glucose tolerance minus 58 per cent. of the protein.

Fat should furnish enough calories to equal the basal caloric needs minus the calories supplied by protein and carbohydrate.

The amount of fat must be within limits, which will prevent the development of ketonuria:—

2.5 – 4 gm. of fat.

1 gm. of available carbohydrate.

The Transformation of Protein into Fat and Fat into Carbohydrate in the Body (Harry Victor Atkinson, B.S., *Journal of Metabolic Research*, vol. i, No. 5, May, 1922).—When the glycogen reservoirs of the body are low the ingestion of meat in large quantity results in the deposition of glycogen.

The continued ingestion of much meat brings about the retention in the body of a pabulum consisting partly of glycogen and partly of fat. Only when meat in very great excess is given is fat alone retained.

Morphine depresses the oxidative processes in the body.

When fat alone is given to a dog in large quantities there is an increase in the blood sugar.

The increase in sugar supports the opinion that fat can be transformed into sugar.

Gland Puncture as a Diagnostic Measure (C. G. Guthrie, *Bulletin of the Johns Hopkins Hospital*, vol. xxxii, No. 366, August, 1921).—The author is a firm believer in the gland puncture method on account of its rapidity, a definite diagnosis frequently being made in ten or fifteen minutes. Another advantage of the method is that thin preparations like blood films are secured, which are suitable for the application of a blood stain or special stains for cells, bacteria or protozoa and which permit the use of an oil-immersion lens in their study.

The procedure is practically painless to the patient—more so than the ordinary venipuncture—and moreover, it leaves no scar. It does not interfere with any subsequent excision or histological study of the gland.

The Treatment of Paludism by "Trepol" (E. Conseil and F. Gerard, *Bulletin de la Société de Pathologie Exotique*, tome xv, No. 7).—The remarkable spirillicide action of trepol (tartar bismuthate

of potassium and sodium) led the authors to think that, perhaps, its parasiticide action, like that of of arsenobenzol, might extend to the haematozoic parasites.

They gave this new product in certain serious cases where quinine had given no definite results whatever. The majority of the patients were Russian refugees, who suffered from a severe form of paludism and had been already treated by quinine, either by injection or by the mouth.

It was found that in the treatment of paludism by "trepol," carried out in about ten cases, varying results were obtained. In the majority of cases its action proved to be distinctly inferior to that of quinine.

Case of Filaria loa Infection (G. C. Low and E. J. O'Driscoll, the *Lancet*, April, 1921).—The authors suggest four different points to help in the diagnosis of *Filaria loa* infection: (1) The actual presence of the adult worm in the eye; (2) the presence of *F. loa* embryos in the peripheral blood during the day; (3) the presence or definite history of Calabar swellings; and (4) eosinophilia in people from the endemic area, with nothing else to explain its presence.

Danger of Cattle Introducing African Fever into Madagascar (E. Brumpt, *Rev. Hist. Nat. App.*, Paris, July, 1921).—The author is of the opinion that there is a great danger of introducing African fever into Madagascar by means of cattle. The danger of transporting cattle from one hot climate to another is very great, and one of the ticks carried by cattle, *Rhipicephalus simus*, which is a transmitter of African fever, is already present in Madagascar.

A Method for the Cultivation of Blastocystis (Harvey P. Barret).—The culture media used in this work is very simple, being made up of human blood serum and 0.5 per cent. of sodium chloride solution. This solution is sterilized in the autoclave and the serum added after inactivation at 55° C. for one half hour. This is faintly alkaline to litmus. The medium is distributed in narrow test tubes in quantity sufficient to give a column of fluid at least 100 mm. high. No growth takes place at the surface of the tube, and the parasites multiply best at the lower portion of the tube, evidently needing little free oxygen for their growth.

In making the initial inoculation, a small portion of stool or an emulsion of faeces in salt solution is placed at the bottom of the tube containing the culture medium. The culture medium is incubated at 37° C. for twenty-four to forty-eight hours, and then examined for blastocystis. It is best to examine early cultures every twenty-four hours in order to note the degree of growth of blastocystis, and to make transfers before bacterial contamination is too heavy. If good growth is obtained after twenty-four hours, a transplant is then made into fresh culture medium, using the sediment in the original tube.

Comparative Treatment of Cases of Hunger-Osteomalacia in Vienna, 1920, as Out-Patients with Cod-liver Oil and Plant Oil (Margaret Hume and Edmund Nirenstein, M.D., *Lancet*, vol. cci, No. 5121, October, 1921).—One hundred and seventy-seven cases of hunger-osteomalacia were treated as out-patients in Vienna. Of these, only 130 entered into the final analysis of the experiment. About one-third of the number was treated with a plant oil (subsequently identified as belonging to the rape oil group) containing phosphorus, the other two-thirds with cod-liver oil. Most of the patients made progress, but some of the patients on plant oil had to be transferred to cod-liver oil, and some of those on cod-liver oil had to have the dose increased before good progress could be made.

The results fall into a series: doses of about 100 c.c., 150 c.c., and 200 c.c., of each of the two kinds of oil were given. The smallest doses of plant oil gave the worst result, and the largest doses of cod-liver oil the best; the smallest dose of cod-liver oil was better than the largest dose of plant oil. Once a good improvement was set on foot, it could not be detected that the rate of progress on different doses varied much.

It is provisionally concluded that cure of the disease was due to addition of vitamine A rather than of fat as fat to the diet.

The relation of hunger-osteomalacia to the osteomalacia of pregnancy is regarded as quite uncertain.

Current Literature.

INDIAN MEDICAL GAZETTE.

Vol. LVII, No. 11, November, 1922.

The Production and Pharmacological Action of Khesari Amine (Hugh W. Acton and R. N. Chopra).—Khesari dal as sold in the bazaar contains two kinds of seeds, as regards their germinating properties: from 25 to 50 per cent. germinate, the rest fail to sprout.

The germinating processes increase the total amount of amine in the grain, explaining the frequency of this disease during the Monsoon.

The toxic principle resides in the non-volatile amines, which are soluble in water.

The main pharmacological effect of the non-volatile amines is slight vaso-constriction.

Large doses of non-volatile amines are required to reproduce the disease in animals, indicating a difference in susceptibility.

Man, although probably more susceptible than most animals, requires large doses as well, e.g., the close association between an exclusive vetch diet eaten by herdsmen during famine years, and the frequency of lathyrism.

In many the lesions are permanent, indicating destruction of the tracts of the cord: in animals the disease is transient and soon passes off, suggesting ischaemia and interference with function, rather than permanent destruction.

A Case of Salivary Calculus (Guran Dutta Mall).

—The patient was admitted to hospital suffering from extreme emaciation, inability to take food, and an offensive and purulent discharge from the mouth. The patient had suffered from this trouble for twelve years, and had been in the habit of having the swelling punctured by a barber when it increased in size. Twelve days prior to his admission to hospital the swelling had increased to such a size that the intake of even fluids was difficult.

On examination it was found that the mouth was kept half open and a very purulent discharge constantly dribbled from it. The tongue was coated with a thick fur and retracted. The floor of the mouth was the seat of a big swelling about the size of an orange. The duct of the left sub-maxillary gland was tremendously dilated and hard to the touch.

Operation.—An incision was made into the duct of the left sub-maxillary gland and a calculus was found embedded in the duct with its flattened surface lying under the under surface of the tongue and one end towards the gland. An attempt to remove the calculus with a S.W. artery forceps failed. The handle of a scalpel was then passed along the under surface of the stone which was tilted up and its final extraction completed with a lithotomy forceps. The calculus was fusiform in shape and of a phosphatic nature. It weighed 9 dr. Recovery uneventful.

A Case of Oxyuris vermicularis in the Vermiform Appendix (W. L. Harnett).

—The author describes the case of an Anglo-Indian, aged 26, admitted to the General Hospital, Calcutta, complaining of pain after food and morning vomiting. He had lived in Calcutta all his life, and there was no history of any previous illness of importance. For the past eight months he had suffered from bilious vomiting every morning on awaking, after which he was comfortable for the rest of the day. The bowels were habitually constipated. Lately there had been epigastric pain half an hour after food, and for a week before admission to the hospital had vomited about two hours after each meal, the pain being then relieved. The patient was a poorly-nourished young man, of sallow complexion, with a slight icteric tinge of the conjunctivae. There was general tenderness over the epigastrium and the right upper quadrant of the abdomen, but no tumour could be felt. The liver edge was palpable, but the dullness was normal to percussion. The spleen was not palpable, and the tenderness did not extend down to the appendix region. The tongue was clean and the temperature normal. Thorax normal. Wassermann reaction negative.

The abdomen was opened under an ether anaesthesia by an incision and the appendix examined. This was found to be free from adhesions, but the distal end was bulbous. It was removed and the abdomen closed. On examining the appendix, the mucous membrane was found to be in a state of intense catarrh, there was a fecal concretion at the distal end and proximal to this a living *Oxyuris vermicularis* was found lying on the mucous membrane.

As soon as the patient was convalescent from the

operation, salt and quassia enemata with further santonin treatment were administered to remove any oxyuris still present, but none were passed. It is probable that others were originally present, but were got rid of by the preliminary medical treatment. Convalescence was uneventful.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE
EXOTIQUE, October 11, 1922.

Presence of Spirochætes in the blood of Europeans suffering from Blackwater Fever. The etiologic problem of this Spirochætositis (M. Blanchard and G. Lefrou).—The authors have made a careful study of spirochætes in the blood and organs of two Europeans suffering from blackwater fever. The patients were in a very bad condition when they entered the hospital, suffering from intermittent bilious attacks and jaundice.

The spirochætes were found in abundance in the sediment from the third centrifugization of the blood. Cultures in human serum were negative. Experiments carried out on guinea-pigs showed that the disease can be transmitted by means of the blood or of liver extract, but not by the urine. Thirty-one guinea-pigs were inoculated, including a series of fifteen guinea-pigs in succession; the inoculations caused hæmorrhagic lesions and death occurred after forty-eight hours—seven days. The spirochætes in the blood and organs of the animal were identical with the human type.

A comparative table is given showing the relationship of the chief characteristics of the blackwater fever spirochæte and five other spirochætes of the principal tropical diseases. The technique of triple centrifugization is described.

On the Subject of Compressed Quinine Tablets (H. Seidelin).—The author, contrary to Dr. Blanchard, is of opinion that compressed quinine tablets are most effective for malaria, and gives evidence of their solubility. For the preventive use of quinine, a dose of 1 grm. during two consecutive days weekly, increasing the dose according to the virulence of the infection, is considered to be the best. Giemsa's reagent was found to be superior to Tanret's as a test of quinine in the urine.

Concerning H. Seidelin's Note: On the Subject of Compressed Quinine Tablets (M. Blanchard).—The author maintains his previous statements on the subject, and supports them by reference to M. Maurice Bouvet's work "La Fabrication Industrielle des Comprimés Pharmaceutiques," and quotes several well-known authors on the same subject, giving instances of the insolubility of tablets.

First Experiments in Gabon with Oryaminophenyl-arsenic Acid (189) in Human Trypanosomiasis (P. Clapier).—The author describes twenty-two cases of trypanosomiasis treated with "189" by intravenous and subcutaneous injections, in doses of 0.20 to 0.40 grm. per kilo. The clinical symptoms were ameliorated and sterilization of the cerebrospinal fluid obtained. The

most favourable cases were those in which there was no evidence of trypanosome in the cerebrospinal fluid.

For patients with ocular troubles, nephritis, enteritis or hepato-splenic sclerosis, the dose should not exceed 0.015 grm. per kilo, and subcutaneous or intravenous injections are preferable, as too strong a dose in such cases may be disastrous.

Massive doses administered by the mouth were found to be ineffective.

A Case of Vesical Bilharziosis in Damascus treated by Antimony by Intravenous Injections (Pommé and Abdel-Kader Sabagh).—A patient suffering from hæmaturia was sent to the hospital at Damascus, and was treated for thirteen days with tartar emetic injections, which greatly ameliorated his condition. Examination of the urine showed red blood corpuscles in abundance, leucocytes, bladder cells, and a number of *Schistosomum hæmatobium* eggs 140 to 160 microns in size. Examination of the stools gave negative results. This is the first case of bilharziosis observed in Damascus.

The Ravages of Malaria in Corsica (A. Ortoni).—It appears that the cases of paludism have increased greatly in number and virulence in Corsica since the war.

The author states that during his last visit to a small village, more than three-quarters of the population were affected with the disease. Quinine in doses of 0.50 grm. or 1 grm. *pro die*, was ineffective.

Trépol or Tartro-Bismuthate of Potassium and of Sodium in Human Trypanosomiasis (Van den Branden and Van Hoof).—The description is given of three cases of trypanosomiasis treated with injections of tartro-bismuth. Lumbar puncture showed abnormal cephalo-rachidian liquid, containing lymphocytes in two cases; in the third the liquid was normal. The trypanosomes disappeared in the peripheral blood.

Puncture of the Spleen and the Bone-Marrow (J. Caronia).—The author recommends puncture of the spleen for the investigation of leishmaniasis and malaria: but gives preference to puncture of the bone-marrow as there is no danger of hæmorrhage.

He describes the two methods adopted for several years and gives the advantages and disadvantages of each. For puncture of the spleen the only instrument used is a fine needle which prevents tearing of the tissue. For puncture of the bone Weindrand's needle is used.

Experiments of Hérèlle's Method in French Guiana for the Destruction of Acridix (M. A. Cheyssié).—The author gives an account of the results of the inoculation of locusts with *Coccobacillus acridiorum* following the technique of Dr. d'Hérèlle. Black diarrhœa ensued, and death after a few hours. Microscopical examination showed numerous coccobacilli.

Graham-Smith Bodies in the Red Blood Corpuscles of a Primate (Macacus rhesus) (Andre Leger).—This parasite, first observed in the blood of a mole, has been found in a primate of Indo-China, and the author calls it *Grahamella rhesi*. A few of the cells containing parasites were slightly hypertrophied; after coloration they were seen to be filled more or less with

bacillary and coccid structures, often agglomerated together. In preparation of fresh blood no *Grahamella* appeared, but there were a few nucleated cells. The animal showed no signs of ill-health.

Typhoid Fever of the Malgaches in Emyrne (Bouffard and Girard).—The Malgaches are found to be very susceptible to the bacillus of Eberth, which the authors identified in four cases. Three of the patients died between the fifth and seventh day of the infection. The cause is due to the presence of bacilli in impure water which the natives consume.

Abnormal Persistence of Yersin Bacillus in a Bubonic Plague Case (M. Leger and Lhuette).—The bubo was in the left inguinal region of the patient and was cured by intravenous injections of anti-pest serum, and daily washing with permanganate of potassium 1/1000.

A Case of Local Anaphylaxis to Emetine. (Edema, Intense Pruritus, Vesicular Erythema following Injections of Emetine (L. Robert).—In this case the patient had a previous history of malaria and latent phthisis, and of amoebic dysentery since 1910. In 1916 injections of emetine were effective, but the dysentery reappeared in 1920; two months after the first injections of emetine the disease reappeared and further injections were followed by slight oedema. Since that time successive injections of emetine have been followed by oedema and pruritus, the anaphylactic symptoms becoming more and more severe.

Obituary.

COLONEL KENNETH MACLEOD, M.A., M.D.,
F.R.C.S. Eng., (Hon.) LL.D.

THE death at the ripe age of 82 years of Colonel Kenneth MacLeod, Hon. Physician to His Majesty the King, and formerly of the Indian Medical Service, removes one of the most able and distinguished men among the many eminent medical officers who have adorned the Indian Medical Service. Son of the Rev. Norman MacLeod, he graduated M.A. at Aberdeen in 1857, and M.D. with honours at Edinburgh in 1861. Later he passed first of seventy candidates for the Indian Medical Service, and after three years' service in military and civil employment in India, was appointed a member and Secretary of the Indian Cattle Plague Commission. In this capacity he did excellent work, which procured him, when this Commission ended its labours, the appointment of Secretary to the Surgeon-General Indian Medical Service. But it did more than this. The experience so gained gave him an insight into the large amount of disease affecting the domestic animals in India, and made a great impression on his mind as to the urgent need and the vast economic importance to India of a thorough knowledge of the diseases of these animals and of their scientific treatment and prevention. He further had recognized that there were certain inter-relations between some of the diseases of animals and man,

and that much might be done by experimental investigations into the diseases of animals which might be helpful in elucidating the causal agents of some of the diseases in man. He was convinced that it was only by the establishment of Veterinary Colleges in India itself, where students could be taught and trained, and research carried out, that this knowledge could be imparted and advancement secured. During his long service in India he never tired of using every influence on every possible occasion to convince others of the need, and ultimately with success. On the eve of his departure from India he had the satisfaction of attending the ceremony at which the foundation stone of the Bengal Veterinary College was laid by Sir Charles Elliott, the Lieutenant Governor of Bengal. MacLeod will always be remembered by the Indians as a benefactor to their country by the establishment of this College, which owes its inception to him. He was much liked by the Indians with whom he came in contact, and among whom he made many life-long friends. For five years he was Professor of Anatomy at the Calcutta Medical College, and for thirteen years Professor of Surgery to the College and first surgeon to the Hospital. For a part of that time he was Consulting Health Officer of Calcutta, and later became a Municipal Commissioner. He founded the Calcutta Medical Society, and was Editor of the *Indian Medical Gazette*, which under him exercised an important influence on the advancement of scientific medicine and research. He could have risen to the highest position in the Indian Medical Service, but administrative work had no attraction for him. He received no honours for his services in India.

On returning from India Colonel MacLeod was appointed in 1893 a member of the Medical Board at the India Office, and in 1897 Professor of Clinical and Military Medicine at Netley, which he held until 1905. During the Great War he acted as Military Representative on a recruiting tribunal, and was thanked for his services by Sir Auckland Geddes.

Exceptionally methodical, MacLeod got through an immense amount of work with the utmost ease, and had always time to devote an hour or more to the literature of the day. He was a great novel reader. A typical Highlander, he was fonder of home than of general society, and it was in his home among his most intimate friends he was seen at his best, and where his fund of humour, merry twinkle in his eye, pleasantries, learning and human sympathy made him a delightful companion. He was twice married, and leaves a widow and family of sons and daughters.

W. J. R. SIMPSON.

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Original Communications.

DESCRIPTION OF THE DISEASES OF MONGALLA.

By El Bimbashi N. CANTLIE, M.C., M.B., F.R.C.S.,
*Medical Corps, Senior Medical Officer, Khartoum District,
 Military Hospital, Egyptian Army, Khartoum, Sudan.*

THE diseases met with in the Province of Mongalla are typical of those of Central Africa and the following description is intended only to give an impression of such as I have seen during my stay in the Province. Many of the subjects mentioned are of necessity imperfect owing to lack of continuity in the treatment of patients and the difficulties connected with the attendance of natives who come and go as they wish and are apt to discontinue treatment on their own account. The diseases are set down in the order of their importance.

SMALL-POX.

The scourge of Central Africa claims its victims year by year. The disease is endemic in the province and at times assumes epidemic form generally about the commencement of the rains in March or April.

The mortality varies but I think rarely exceeds 10 per cent. The cases show the typical features of the disease and do not need description here.

The question as to whether the disease is true small-pox or alastrim is not easy to answer. I have certainly seen many cases in children and the mortality is often low.

The disease spreads from one village to another, but as the population is very scanty and the distances between villages considerable, slow progress is the rule.

The natives in some districts send away small-pox cases into the forest and I have heard of instances where the sufferers have been killed in order to stamp out the disease. Generally, however, the apathy of the negro prevails, and one finds the cases living with others in the same hut.

Vaccination is certainly the most important duty in medical work in the province. Every effort requires to be made to compulsorily vaccinate the whole population, both on health and economic grounds.

The deaths due to small-pox result in great loss of man-power with consequent shortage of labour and of carriers, loss of revenue from the death of taxpayers and depopulation of the country. Unfortunately there are many difficulties which the medical officer has to contend with:—

(1) The small-pox vaccine supplied is in the powder form, and at times gives very poor results. The journey of 1,000 miles from Khartoum, the absence of ice or ice-chambers and the effects of the climate in Mongalla lead to deterioration in the effectiveness of the powder, and after vaccinating many thousands, one is quite uncertain how many hundreds or even scores will turn out successful.

(2) The natives themselves are in some cases not anxious to be vaccinated and will run away to avoid it on the doctor's approach. I have been told many

times "no, we don't want your medicine, it will kill us," and in spite of all efforts to persuade them, perhaps only half-a-dozen men will appear. The origin of such a belief is probably due to natives having been vaccinated with powder which has proved ineffective and has not taken: and shortly after some of these same people have contracted small-pox and died. Such an occurrence is quite enough to condemn the powder as the cause.

(3) The distances to be traversed and the absence of roads and transport animals makes the visiting of every village a slow and lengthy proceeding.

For these reasons there are many parts where the natives are quite unprotected by efficient vaccination,



A pretty typical case of small-pox, showing pustules and swelling of the face. Recovery.

although they have a system themselves of vaccinating each other from the pus obtained from a small-pox pustule, often with dire results.

To carry out vaccination efficiently the following steps are recommended:—

(1) The investigation of the efficiency of vaccine which has been made in Europe, sent to Khartoum, and then exposed in Mongalla to the African climate without ice or cool chambers. The need arises of trying to improve on present conditions by perhaps using powder before it is too old, the provision of cooling chambers, or the establishment of a Vaccine Institute in the country. This last mentioned measure

after careful consideration, I understand has had to be abandoned.

(2) The following method of vaccinating with the addition of glycerine to the powder, I have found to give the best results.

(3) When proceeding on vaccinating duty sufficient police should always be provided to compel the natives to attend. There should be no chance of refusing.

(4) The question of improved communications depends on the money required to make roads and provide means of transport. Distances which now take a week to cover, might be done in one third or less of the time.

(5) A number of intelligent natives could quickly be taught the principles of vaccinating, and these could be at work in every district under the eye of the District Commissioner during his inspections.

YAWS.

This characteristic disease is extremely common in most parts of the province and no district can be said to be free from it. The usual manifestations as described in textbooks are seen and the following description is based on Castellani's and Chalmers' account.

The statement that yaws does not occur in the mountains or at a higher level than 800 ft. (Castellani and Chalmers, p. 1537) is refuted by experience here. Cases are very common from the upland mountainous regions around Torit at levels of 1,000 to 5,000 ft. or more above sea level.

Next to small-pox it is the commonest disease in the province, as shown by the fact that over 50 per cent. of the patients in hospital suffer from it.

Etiology.—A treponema has been seen in scrapings taken from the unbroken secondary lesions.

Primary stage.—The fact of a primary stage is recognized by the natives who call it the "mother yaw" and can always point it out when questioned. The incubation period is difficult to be sure of, as the natives have a very rough estimate of time and sometimes state years when they mean months. One fairly reliable patient said that a woman with yaws visited her and two months after her departure she developed the "mother yaw." The primary lesion occurs on the face, arm, leg and trunk. I have never seen it on the penis, labia, or genitals. Those seen were about 1 to 2 in. in diameter, covered by a scab which at times can be peeled off, when a smooth fleshy pink granulating mass is visible. At other times a raised greyish crust appears with overgrowth of epidermal tissue forming finger-like processes reaching down into the true cutis. The primary lesion is nearly always still in evidence when the secondary eruption breaks out and seems to heal up quite as rapidly under appropriate treatment.

Secondary Stage.—About a month or longer after the primary yaw is seen, a generalized eruption takes place. The eruption begins as small raised rounded sub-epidermal nodules which gradually enlarge, break through the skin, and develop into the typical secondary lesions. I have seen a case where the whole body was covered with raised flat-topped sub-

cuticular nodules about 2 in. apart. Appropriate treatment removed every trace of the disease before any lesion of the actual skin occurred. The typical secondary lesion is a raised rounded projection covered with a honey yellow or brownish crust of dried secretion. On removing the crust, a flabby pinkish overgrowth of granular nature is seen, exhibiting groups of papillary-like projections which can readily be separated from each other. On squeezing the lesion, the separation between the papillae is made evident and from the interstices a thin purulent secretion oozes out.

Lesions occurring in the flexures owing to the moisture present are devoid of any crusts, but are round flat-topped projections similar to condylomata.



An endeavour to show a case of yaws affecting the face and neck, but unfortunately the sick man is out of focus.

The eruption occurs on every part of the body, from the crown of the head to the soles of the feet. The face is a common site, and I have seen the eyelids, ears, lips, and nose affected. Confluent lesions often occur. The scalp is also attacked. The fingers, arms and legs, especially the flexor aspects of the elbow and knee, the trunk, and especially the armpits, and between the thighs and buttocks are affected. The palms of the hands and soles of the feet sometimes show septic ulcerations which are painful, or again there may be warty-like projections.

In contradistinction to syphilis lesions on the mucosa of the mouth or throat are never seen, but some small ulcerations on the nasal mucosa I have put down to this disease.

At times the secondary lesions break out in a ring form with unbroken skin in the centre, the so-called

circinate yaws. The ring varies from 1 to 2 in. in diameter and affects the face, chest, abdomen, and armpits.

Again I have seen both knees covered with crusts of dried secretion, and apart from one circular patch on the abdomen, the rest of the body quite free. Scars resulting from the secondary skin lesions can always be seen on close inspection.

Lymphatic glands are enlarged and painful when the eruption is present. They have not the shotty feeling of the syphilitic gland; they never ulcerate.

The lesions of the locomotory system as described by Castellani and Chalmers, I believe, should be placed in the tertiary stage, as I have seen them occurring in conjunction with ulcers certainly tertiary in character and as late as twenty years after the secondary rash.

Tertiary stage.—(1) Joint system: The presence of joint lesions is by no means uncommon. The cases seen complained of severe pain, especially affecting the knees, elbows, and wrists. A chronic arthritis affecting these joints occurs, and is very crippling to the patient. Swelling of the joint is slight or absent, but the formation of small bony osteophytes with marked grating on movement is common, especially in the knees. These lesions are exceedingly chronic and lead later to deformity with contractures of muscles. The treatment is unsatisfactory and rarely leads to improvement.

(2) Bone lesions: A periostitis affecting the tibiae, radius and ulna, and metacarpals occurs. The tibiae become typically "scabbar" at times and show distinct forward bowing. Irregular growth of the bones of the forearm leads to deformities. Destruction of the skull bones occurs following on extensive scalp ulcerations and leads to a "worm-eaten" condition exposing the meninges. Extensive ulceration and destruction of the nasal bones and palate described as gangosa I have seen in two instances and, although it rarely occurs in Mangalla, I ascribe yaws as the cause.

(3) Skin lesions: Chronic skin affections are very common. They occur in the form of large fungating offensive ulcers on the limbs, hands, toes and scalp, at times reaching to the bone. I think that many ulcers seen after the secondary eruption has passed away are not tertiary in origin, but are due to secondary infection of ulcers resulting in extensive chronic lesions which last for years.

(4) In the tertiary stage the palms and soles often exhibit a peculiar pitted appearance; the skin shows a line of demarcation of the disease and in the centre small hardened pits in the skin exist, the result of a septic process involving the papillae which in course of time come away.

(5) No evidence of gummata in the tissues was seen.

(6) Neither tertiary affections of the nervous system, nor eye, vascular or visceral changes have been seen.

Communicability.—In the absence of certain knowledge on this point, direct contact or biting flies would seem to be the most likely channel of infection. In the Acholi country, young children and youths up

to 15 years of age, were alone found suffering from this disease, probably because the adults were immune through previous infection. Among the Latuka, Baria, and others, children and adults seem equally affected. No Europeans, Syrians, or Egyptians, contracted the disease.

I have no information as to its effect on the birth-rate by causing abortion.

Diagnosis.—Quite easy in most cases, the disease showing most characteristic lesions. In the late tertiary stage it may present greater difficulty. Syphilis is rarely seen in Mongalla Province and diagnosis depends on the primary sore, the mucous lesions and the effect of mercury and potassium iodide. Lesions complicated by secondary infection form very large septic ulcers, which will be clinically difficult to distinguish from tropical ulcers and forms of blastomycotic ulceration, but the presence of the typical eruption should enable distinction to be made. In addition there are other points of distinction which will be referred to under the heading of tropical ulcers.

Prognosis.—Not serious as far as life is concerned. The affection is most unsightly and may, by arthritis, cause crippling and marked disability. Chronic ulceration of the scalp may lead to death through septic infection of the meninges, and one case I saw must have died in this way. The great majority of cases seem to recover, although young children may die from sepsis due to secondary infection. In some places the natives isolate the sufferers until the secondary rash has disappeared.

Treatment.—The effect of salvarsan is astonishing: 0.6 gm. given intramuscularly into the buttock will, in seven days, clear up the most foul and unsightly ulcers. It is difficult to estimate the dose required for complete cure without a Wassermann reaction, which is not possible in Mongalla. The usual method is two intramuscular doses of 0.3 gm. each at an interval of seven days. For children smaller doses are given in proportion.

Method.—(1) The intramuscular injection is regarded as the best method. The drug is absorbed slowly, and seems to have a maximum effect on the lesions. The powder is dissolved in sterile water and injected into the buttock. A fairly painful local reaction usually results and lasts for four or five days. Intravenous injection does not seem to give such effective results, possibly because the drug is eliminated from the system more rapidly.

(2) Hectine: The drug is less efficacious. After trial, I think that twelve intramuscular injections of hectine given daily are equal in result to one full dose of 0.6 gm. of novarsenobillon.

(3) Yaws mixture: The custom has been to give Castellani's mixture to all patients daily in conjunction with the novarsenobillon or hectine treatment. The mixture is composed as follows:—

R tartar emetic	...	...	...	1 gr.
Pot. iodide.	...	...	...	5i.
Sodii salicyl.	...	...	...	gr. x.
Sodii bicarb.	...	...	...	gr. xv.
Sodii tartarat.	...	...	...	gr. x.
Glycerine	...	...	...	5ii.
Aq. ad.	...	...	...	3ss.

This is given three times a day well diluted in four times the quantity of water. Children receive proportional doses according to age. Only once have I seen vomiting and stomach pain caused by the mixture.

(4) Antimonium tartrate: Intravenous injections of this drug have not been found to affect the lesions in the least.

(5) The sores are cleaned with corrosive sublimate 1 in 1,000, or with eusol, and dressed daily.

(6) Trial has been made at Mongalla by Bimb. Clarke and Yuz Jabro of injecting the serum obtained from cases treated five days previously with doses of novarsenobillon. A blister is obtained and the serum injected intramuscularly into the buttock. Four days after no signs of alteration in the lesions could be detected, and unfortunately the two trial cases then ran away from hospital.

SYPHILIS.

This disease only occurs in towns where it has been introduced by Arabs and others from the north. In the districts away from the hills I have never seen a case of syphilis in a native of Mongalla. It is an interesting point to consider the question as to whether the prevalence of yaws might lead to the immunity against syphilis.

GONORRHEA.

This disease is common. Amongst towns on the Nile, as Mongalla, Regaf and Bor, it is especially prevalent. The course and treatment are as usual.

SOFT SORE.

A common affection, especially amongst the Dinkas and Barias and in the river towns. Ulcers occur on the foreskin, glans, scrotum, abdomen, thighs and vulva. The course and treatment are as usual.

PHIMOSIS.

A common condition, but only seen at hospital when complicated by inflammatory troubles of glans or urethra.

Circumcision is not practised amongst the tribes in Mongalla. One Dinka in hospital resolutely refused to be circumcised while he had a large septic sore under the foreskin, as he said on his return, being naked, the women of the village would laugh at him.

PARAPHIMOSIS.

Rare.

TROPICAL ULCERS.

Ulcers on the lower limbs occur in a large percentage of the population. Bare feet, thorns, cuts from stones, and wood, with subsequent infection by dirt and flies lead to ulcers of all shapes and sizes. From all these one may distinguish a typical tropical ulcer by the following characteristics:—

(1) The ulcer usually occurs near the ankle.

(2) The ulcer at first is a small funnel-shaped circular lesion, about 1 in. in diameter, but later develops into every manner of shape and size, perhaps involving half the circumference or more of the leg.

(3) When typical, the lesion is circular, deeper at

the centre and funnel-shaped; reddish granulations are seen at the fundus covered by a membranous deposit of dark decomposing detritus and secretions. Yellow pus is conspicuous by its absence. Large chronic ulcers are more irregular in shape, and often have a punched-out appearance. The margins are abrupt, raised, well-defined and often very hard. The floor of the ulcer is smooth and level, the granulations pale and weak.

Tropical ulcers show no attempt at natural repair, and pass into a chronic condition lasting for years. I have never seen ulcers involving tendons and bones as sometimes described. Pain is not a marked feature, especially in the chronic type.

Bacteriology.—From the typical small ulcer, smears show large numbers of well-defined spirochaetes with about eight to ten rather irregular waves, and also long spindle-shaped bacilli with tapering ends. From the large ulcers, organisms of many kinds—cocci, coccobacilli and spirochaetes in fewer numbers can be obtained.

Differential Diagnosis.—Tropical ulcers must be distinguished from simple infected wounds, from



A case of disease which resembles in appearance madura foot, but is not. It is probably a blastomycosis or leishmaniasis I think. Pretty common here. The skin alone affected by ulceration, but large connective tissue swelling of tissues of foot.

ulcers due to yaws and syphilis, from cutaneous leishmaniasis and blastomycosis. The points mentioned above will serve to distinguish them in most cases.

Treatment.—The following method of treatment has been adopted with marked success. It has been found to give better results than any others: A daily bath for one hour with hydr. perchlor. 1 in 2,000, followed by boric fomentations every four hours. This soon removes all secretions and leaves a clean granulating base. The following ointment is then applied:—

Equal parts of:—

Zinc oxide.
Salicylic acid.
Ungt. hydr. ammon.
Vaseline.

The ointment is put on about half an inch thick all over the ulcer and left for three days without dressing. It is then removed, the ulcer cleaned, and fresh ointment re-applied. Rest of the leg is im-

portant, and the patient should be put to bed. Ulcers which have resisted treatment for months have rapidly improved under this method.

Protargol powder and ointment, iodoform, red lotion, hydr. perchloride in powder form, have all been tried, but without good results. The above ointment stimulates the growth of granulation and of the epithelium in a way which other applications will not do. Captain Biggam, R.A.M.C., reports that a primary application of strong formalin leaves a clean granulating ulcer.

Simple ulcers due to infected wounds, abrasions, cuts, thorns, &c., present the usual textbook features.

LEPROSY.

Prevalence.—Leprosy exists to a limited extent in all the districts of the province. The natives do not look upon it as an infectious complaint, and the sufferers live in the villages without attempt at isolation.

After investigation the incidence is estimated roughly at 1 per 1,000 of the population. This is based on the examination of nearly 20,000 natives. The tuberculate and anæsthetic types both exist.

(1) *Tuberculate Type.*—One case I saw had the typical well-marked warty tuberculate growths on the face and ears, giving him the characteristic leonine expression. One also frequently sees leprotic ulcerations of hands and feet with deformities or loss of all or portions of fingers and toes. Light flesh-coloured patches due to loss of pigment are common.

(2) *Maculo-anæsthetic Type.*—Cases show the eruption and the anæsthetic areas with loss of hair, ulnar paralysis and wasting of the hand muscles with deformities, and, later, trophic lesions on hands and fingers. Hoarseness is noticed at times. Eye affections seem rare.

(3) *Mixed types* of the disease are most commonly seen.

It has been suggested that a hospital for lepers should be commenced, and this step is certainly advocated. The difficulty would be to obtain the cases as they are unwilling to leave their villages for treatment. It is only by personally visiting each small village and seeing all the inhabitants that patients could be picked out. Such a procedure would mean that cases could only be collected very slowly and after great trouble. Only by compulsion would they stop for the long treatment required.

I have had no experience in the treatment of cases.

GUINEA WORM.

A very common complaint, and a great cause of disability amongst soldiers, police and natives alike. As is natural, the disease only occurs in those who drink the water from khors or so-called wells. River drinkers do not suffer. Nearly all the streams in the Province are dried up between the months of December and April, and all the water in the dry season is obtained from isolated pools, or by digging in water holes in the sand of the khors. The Cyclops must abound in the khors and water holes, as the disease is widespread. Males are chiefly affected.

Duration of Infection.—Castellani and Chalmers say that in one case the worm pierced the skin three hundred and forty-eight days after infection. It would be interesting to know under what condition this man lived, as I think this markedly affects the appearance of the worm. A company of soldiers of the Equatorial Battalion stationed in Mongalla went on a patrol through flooded country. In Mongalla their duties confined them to the station where the ground is drained. After walking for two days through water three men developed guinea worm. When circumstances which favoured the worm depositing its ova in water exist, the worm will rapidly appear through the skin. If such favourable circumstances do not present themselves, the worm lies in the deep tissues and never appears. For this reason I think it is not possible to lay down a rule as to the length of time before the appearance of the worm on the skin.

Symptomatology.—At first a small vesicle forms over the spot, usually below the knee, where the worm is to protrude. The vesicle ruptures and a small aperture appears from which exudes a clear watery discharge. Pus rapidly appears and the surrounding skin becomes very swollen and inflamed. There is now great tenderness and on pressure watery pus oozes from the wound. By palpation the guinea worm can be made out forming a hard brawny swelling reaching perhaps 6 in. from the point of appearance. Pressure everywhere causes great pain. At length the worm appears and the natives extract it by wrapping it round a piece of wood and pulling it out inch by inch every day. This traction causes pain, and great care too must be taken that the worm is not broken, or protracted illness will result.

Microscopical examination of the fluid readily shows the swarms of young embryos of *Filaria medinensis*.

Sites of the Worm.—Usually it appears on the leg below the knee as one would expect in a native walking barefooted through water. In this situation it may appear at any spot, including the sole of the foot, between the toes, &c. I have also seen the worm appear in the thigh, the palm of the hand, the finger, the forearm, the abdominal wall and the scrotum.

Treatment.—A cheap and efficient cure is still to be found for this very disabling disease. With the native method of treatment, about three months passes from the commencement of the swelling to the final extraction of the worm. The injection of novarsenobillon is sometimes effective, one dose of 0.6 gm. will often kill the worm *in situ* in the tissues. An abscess will result however, which will often require a small operation to open. When novarsenobillon is not available, the method of treatment in hospital has been by hot fomentations and by extraction on a match. This is effective, but may take two or three weeks to accomplish. The injection of 1 in 1,000 perchloride of mercury I have found exceedingly painful and not effective.

Prophylaxis.—It is impossible to prevent the disease as natives drink the water from all pools

and khors. No wells exist into which steam could be passed as suggested by Leiper. The drinking of water which has been filtered through a "Zeer" protects officers and officials. In outstations much could be done to eliminate the disease amongst soldiers and police by compelling them to drink only water either filtered through a "Zeer" or strained through a cloth. To carry this out it would be necessary to increase the number of "Zeers" supplied and the difficulties of making such an order effective would be considerable. The "Zeer" is a large porous earthenware jar, through which water percolates and drops into a receiver below.

Infection can take place in Mongalla at any time of the year. Major Archibald, of the Wellcome Tropical Research Laboratories of Khartoum, reports the Cyclops most prevalent during the rainy season. The disease generally appears during the rainy season between May and November, for then the natives walk with bare feet through swamps and rain, and the worm is attracted to the surface. I cannot say whether the worm appears in the first rainy season or the second after infection.

BILHARZIA.

This disease in its rectal form has for the first time been found existing in three natives of Mongalla, none of whom had ever been out of the Province. The first case was in a boy about 12 years old, who had lived all his life in Regaf, Gondokoro and Mongalla. The second case was a man in Mongalla prison who became sick after three months stay there. Previously he had been living in his village thirty miles from the Nile. The third case was a Dinka from the Bor district.

All cases complained of severe pain, intractable diarrhoea, blood-stained stools and emaciation. The lateral-spined bilharzia ova were easily found on microscopical examination. The men affected both nearly died but treatment by antimonium tartrate resulted in disappearance of all symptoms. The boy had no antimonium tartrate as none was available at the time. As he had ankylostomiasis as well, this was treated by thymol with a result that he never complained of pain or diarrhoea again, nor could bilharzia ova be found after three microscopical examinations. I have had no chance of examining him again though he was well and doing his work as a servant one year after.

One does not infer from this that thymol had any curative effect but it illustrates how a native without symptoms and doing full work may be suffering from this serious affection.

How these cases were infected I cannot say; there are doubtless many others existing if properly searched for. The infection was probably originally brought from Egypt by a soldier or trader.

The intermediary host snails have as yet not been found. *Planorbis boissyi* snails have been reported as found at Malakae—600 miles north of Mongalla, on the Nile—so it is probable they exist also at Mongalla.

QUININE HEMOGLOBINURIA.

In Mongalla eight cases of quinine haemoglobinuria have been seen. A few cases will be described to illustrate the usual form of the disease.

Case A.—Berberine Arab, aged about 30, native of Khartoum, had been in Mongalla in 1918, 1919 and 1920: taken ill in April, 1921, during my absence. I was told he had had blackwater fever and had recovered. I was asked to examine him and report whether he was fit to remain in the Province. He was examined at 11.30 a.m. one morning. He was anæmic and looked ill. He said that, previous to his admission to hospital, he had had attacks of fever for which he rarely had taken any quinine. *The day previous* to his admission to hospital he had taken quinine. I was unable to find out the quantity. While in hospital quinine had been stopped and purges given, with a result that the urine became clear and in six days he was discharged. He said he had taken no quinine since his discharge from hospital ten days before. I therefore gave him at 11.30 a.m., $7\frac{1}{2}$ gr. of quinine sulphate in solution, and said he was to take a quinine and arsenic mixture. At 3 p.m. that day he was again admitted to hospital. At 2 p.m. he had had a rigor and at 2.30 p.m. had passed "black water." On admission his temperature was $103\frac{1}{4}$ ° F.; pulse 106. He had frequency of micturition, passing urine about every half hour the colour of stout. Slight vomiting. Spleen palpable and tender. No jaundice. Quinine was stopped, an enema given and a purgative, and patient advised to drink quantities of fluid. Twelve hours later, the urine was lighter in colour, temperature $100\frac{1}{2}$ ° F., pulse 98. After twenty-four hours the urine was almost clear. Twenty-eight hours after admission he was given one tabloid of 5 gr. of quinine bisulphate. After an interval of four hours he again had a severe rigor. Temperature shot up to $104\frac{1}{4}$ ° F., pulse to 108; and again stout-coloured urine was passed. The quinine again was at once stopped and the previous treatment repeated. The urine gradually cleared in the course of the next two days and after four days was quite normal. Quinine was again started in 1 gr. doses of quinine bisulphate every six hours and gradually increased; 10 gr. of calcium lactate was given one hour before each dose of quinine. The patient stood this treatment well and when discharged from hospital and sent to Khartoum was taking 10 gr. of quinine bisulphate daily, without Ca. lactate. This is a clear case of quinine haemoglobinuria. On two occasions after quinine, "blackwater" appeared; and again disappeared when quinine was stopped.

Case B.—Child, aged 6, of customs official, Regaf, Egyptian. This child has been resident in Regaf for eight months, and had had several attacks of fever during that time. Quinine had been taken irregularly in small quantities of about 2 or 3 gr. at a time, both as a prophylactic and curative measure. Taken ill on June 8, 1921. For about two weeks before the illness, no quinine had been taken. Then 5 gr. had been taken on two successive days. On the third morning, the child had blackwater fever, with a temperature of $102\frac{3}{8}$ ° F., and pulse of 116. Quinine was stopped, an

enema given, followed by a purge, and fluids administered by the mouth. There was no vomiting or jaundice. In twenty-four hours the hæmoglobinuria ceased and the child recovered. Temperature and pulse dropped to normal. Quinine bisulph. in 1-gr. doses was advised, but the child went to Khartoum by the first boat and trace was lost.

Case C.—A translator of Regaf, nationality Sudan from the north, in Regaf for nearly two years. Taken ill in June, 1921. He had had several attacks of fever in Regaf, for which quinine in small and irregular doses had been taken. Whenever he thought he had fever he used to take a little quinine, about half a wineglassful; the quinine was in solution in a bottle. The day previous to his attack of "black-water fever" he had an attack of fever, and when going to bed took two aspirin tablets and some quinine solution. He said he poured about 2 to 3 in. of quinine (? 15 to 25 gr.), and drank it off. The next morning he awoke and passed stout coloured urine, which lasted for twelve hours. When I saw him three days later he had no fever and seemed quite well. His spleen was slightly enlarged and tender. He was put on quinine bisulph. 1 gr. t.d.s., preceded by 10 gr. of calcium lactate one hour before. He had an uninterrupted recovery. The quinine in time was increased to 10 gr. daily, and the calcium lactate stopped.

The history of the remainder of these cases of quinine hæmoglobinuria is very similar, and I think it is worth drawing attention to a few points:—

(1) All cases occurred amongst Egyptians, Arabs or Sudan from the north; no local natives were affected. People of this type make no attempt, as we know, to keep fit; when work is done they sit in their houses and take no form of exercise whatsoever. As a consequence, in a climate like that of Mongalla they become run down and anæmic, thus predisposing to malaria.

(2) In every case we find that the individual had had frequent attacks of malarial fever.

(3) All cases had been eight months or longer in Mongalla.

(4) During the attacks of fever quinine in small and irregular doses had been taken. The usual story was that one tablet, 5 gr. of quinine bisulph. had been taken whenever the individual felt ill. The following morning he would feel better, and would stop taking more quinine until he again felt out of sorts, perhaps two or three days later, when another small dose would be taken. In this way quinine was taken in irregular, and, I think this is highly important, in insufficient doses to have any real effect upon the malaria.

(5) As a result of the above circumstances, a state of chronic malarial cachexia was introduced.

(6) The attack of hæmoglobinuria was invariably precipitated by taking quinine in large amount in comparison with the amounts which the person had become accustomed to. Thus we see an attack being brought on by $7\frac{1}{2}$ gr. in an adult and by 5 gr. on two successive days in a child. Again, after 15 gr. in an adult, &c. The hæmoglobinuria always disappeared in twelve hours to three days after quinine was

stopped, and it reappeared at once if quinine was given in any quantity, as for example in Case A, where 5 gr. caused a relapse.

(7) None of the cases suffered from jaundice.

(8) The above points lead us to the conclusion that this disease occurs in people suffering from chronic malarial cachexia, induced by several attacks of malaria, and for which quinine in small, irregular, and insufficient doses has been taken. The disease is precipitated in a person in the above state by the taking of a comparatively large dose of quinine during an attack of fever. Recovery occurs after stopping all quinine until the hæmoglobinuria disappears, and following this by giving the drug and always in preference the bihydrochloride in small and increasing doses preceded by calcium lactate. No attempt to explain the pathology of the condition is made.

BLACKWATER FEVER.

The only case seen was in a European who had been resident for several years in the Sudan. He had had attacks of malaria spreading over a period of some years, but had recovered his normal health and strength each time. When he came under observation he was taking 15 gr. of quinine on two successive days each week. Within the previous two months he had had three attacks of fever, after each of which he took 30 gr. of quinine for a week or ten days, and then dropped to the 15 gr. on two successive days each week. For the two previous weeks before the last attack he had forgotten to take the quinine on the usual days, i.e., Saturdays and Sundays, and was under the impression that if these usual days were missed he must put off the quinine until the following Saturday and Sunday. In this way he had no quinine for sixteen days, and in addition had had within the last month an attack of malaria.

His final illness began with a chill contracted during a cold night, followed by fever next evening of 101° F. He was given by mouth 30 gr. of quinine bisulphate the first day, and 30 gr. of the bihydrochloride the following day.

On the third morning his urine was dark red, so quinine was at once stopped, and by the evening it was black or "porter"-like in colour. The temperature was remittent, between 100° and 102° F., sweating profuse. Hearsey's mixture was given, and an euema.

The fourth day vomiting commenced, and gradually got worse. Jaundice then appeared—the urine was scanty and there was some frequency of micturition; sweating still profuse; spleen palpable and tender. Fluids were given by the rectum; champagne, ice and sodium bicarbonate by mouth, and Hearsey's mixture continued. Fever still between 100° and 101° F.

On the fifth and sixth days the patient was evidently weaker, the jaundice intense, the urine more scanty, vomiting and hiccough very troublesome, the pulse-rate accelerated. The same treatment was continued, but the patient died on the seventh day.

This was the only case of blackwater fever seen, and it followed the usual course of these cases.

It would appear that the omission of taking the quinine during the two preceding weeks had something

to do with the onset. It is probable the 60 gr. of quinine given during the first two days of fever caused hemolysis of the blood, which was in a "receptive" state following the previous attacks of malaria fever, combined with irregular and insufficient dosage of quinine.

I am inclined to regard this true case of blackwater fever with jaundice and suppression as an aggravated case of quinine haemoglobinuria, and not as a separate entity. The preceding causes of each are the same, and the question whether haemoglobinuria alone will develop, or haemoglobinuria with jaundice and suppression, would seem to depend on the state of the blood at the time, together with the character and the dosage of quinine.

WORM DISEASE.

It is true that a very large proportion of natives suffer from intestinal worms, but they appear to stand the effects of worm diseases with equanimity, and but rarely complain, so that it is usually by chance one discovers the condition. If all stools of patients in hospital were examined, no doubt the percentage of those infected would approach 90 per cent. The following cases have been seen:—

(1) *Ankylostomiasis*.—It is difficult to estimate the prevalence of this disease as so few natives come to hospital for treatment. It does not appear to lead to any appreciable loss in efficiency or man-power. Amongst the young children one sometimes sees a child addicted to dirt eating with an enlarged abdomen and sickly emaciated appearance. Patients who come for treatment show the usual signs of anaemia, perhaps facial dropsy, eosinophilia and fever.

Treatment: Thymol is the drug used for routine treatment. After previous starvation for two days, three cachets of 15 gr. are given at intervals of two hours followed by a saline aperient four hours later. This treatment is repeated after seven days and again after another seven days, if examination of the stools still shows the presence of ova.

Prophylaxis.—In administered towns, such as Mongolla and Regaf, the natives are made to use latrines, and so tend to avoid contracting the disease; but in villages there is no control of sanitation, and so the means of infection is rife.

(2) *Ascaris lumbricoides*.—The yellowish coloured irregular warty coated eggs are to be found at times in the faeces. Cases are treated with santonin or oil of chenopodium.

(3) *Strongylodosis*.—One sees the white slender actively moving larva with its snake-like motion in the faeces without difficulty. The larva is very similar to that of *Ascaris* but the eggs only of this latter are found in fresh faeces, while *Strongylus* is usually in the larval and not in the egg form, owing to hatching taking place before leaving the intestinal tract. They appear to cause no symptoms. Treatment is the same as for *Ascaris*.

(4) *Trichuris trichura*.—The characteristic eggs shaped like an oval tray with handles are occasionally seen in the faeces. The symptoms in those cases seen were nil. Oil of chenopodium or thymol is effective. All the above worms will be found to cause attacks of

fever and eosinophilia. In severe cases of ankylostome infection however, eosinophilia is absent (Archibald).

(5) *Bestole infection*.—This is not very common, I think, owing to the great majority of the natives rarely eating meat. When they do eat it however, the custom of just toasting the meat before a fire gives every chance of infection by these worms. *T. saginata* is the commonest type seen; the infection being derived from cattle. The symptoms and treatment by *Felix* may require no note.

SLEEPING SICKNESS.

A full and detailed description of this disease is out of the question, as the senior medical officer's duties do not involve the treatment of such cases. The infected areas are "closed," and under the control of special sleeping sickness medical officers. I had the opportunity however, of carrying out an inspection in the Opari and Regaf districts and a few notes may not be amiss.

First as to the tse-tse flies *Glossina morsitans* and *Glossina palpalis*. The tse-tse is distinguished most easily from other flies by its characteristic wing position; one wing covering the other in a plane parallel to the fly and projecting posteriorly. The fly alights in a rapid business-like manner, so lightly one cannot at times tell of its presence until the sharp bite is felt. I watched a fly biting on my arm and it was astonishing to see how rapidly and painlessly its proboscis would sink into one's flesh to the depth of perhaps $\frac{1}{2}$ in.

At first one is puzzled in distinguishing between the two varieties. *G. morsitans* one soon learns to know as it is commonly found on the roads and in the forest during the rains, and can be found all through the dry season in reduced numbers. It bites at any hour, but is chiefly evident in the early morning and evening. It is not confined to water, but is to be found far from it in rocks, sand and bush.

G. morsitans is distinguished by the well-marked banded appearance of its back or dorsal abdominal surface; this shows alternate transverse bands of dark sepia and light brown from four to five of each separated by a light brown vertical band running down the centre.

The fly occurs in every district of Mongalla Province with the single exception of the Bor district. It is the carrier of trypanosomes causing disease in cattle, horses and donkeys, with the result that these animals cannot live in the greater part of the Province to the detriment of transport and trade.

G. palpalis.—This fly is not easy to find. It occurs near water and it is usually only by making a fairly prolonged search that one can expect to find a specimen. When found, the shiny black back which, on close inspection shows transverse bands of slightly lighter hue is quite characteristic and distinguishes it at once from *G. morsitans*.

Being so much dependent on water, it follows that the distribution of the fly varies greatly in the dry and wet seasons.

(1) *Rainy Season*.—In the Yei River and Opari districts, the fly is found widely distributed; in

Amadi district, chiefly in the southern part; in Regaf district, the southern portion; in portions of the Torit district, in Mongalla district it is rare; In the Dinka Nuer district absent.

(2) *Dry Season*.—In the dry season the distribution depends on the presence of water and although it is difficult to define its limitations, certainly the numbers of breeding places are very materially reduced, and in countless instances disappear altogether. The fly bites during the day and especially in the cool of the morning and evening, natives resting near khors and rivers during the day being the usual victims.

G. palpalis is the invertebrate host of *Trypanosoma gambiense*, the cause of sleeping sickness in this district. In reality the type of fly found is *G. fuscipes* and not *palpalis*, the distinguishing features being differences in the anal armature.

When inspecting natives in their villages for sleeping sickness, the usual method of examination is by palpation of the enlarged neck glands (Winterbottom's sign). These lie along the anterior border of the trapezius and by nipping the edge of the muscle between fingers and thumb, the glands if enlarged can easily be made out. In young children up to 16 years of age glands are frequently present in this situation without indicating a pathological condition. The glands are enlarged on both sides, are discrete, and have an elastic springy feeling. There may be from two to a dozen in number, forming a chain reaching down into the neck. They vary in size, the largest being comparable to a small walnut. A chain of small glands in an adult is at once suspicious and should lead one to further investigation: the symptoms and signs commonly found in the early stage are:—

- (1) Enlargement of the axillary and inguinal glands.
- (2) Tremor of the tongue.
- (3) Temperature varying from 99° to 101° F. A note of warning here: I have found that *all* suspected natives I have examined have had temperatures above normal. This is probably due to several other causes, such as malaria, filariasis, or intestinal worms, &c.
- (4) Hyperaesthesia. This is a later symptom, but when present together with enlarged glands is conclusive. When making a gland puncture, the patient flinches, or cries out as the needle pierces the skin. Such conduct is most unusual in the savage and indicates almost certainly a pathological condition.
- (5) Enlargement of the spleen and liver. The spleen may be enlarged as a result of malaria, but in all positive cases of sleeping sickness examined I have found the liver easily palpable and reaching $\frac{1}{2}$ to 2 in. below the costal margin on deep inspiration.
- (6) Rapid pulse. On examination natives are so terrified, I find they all have rapid pulses. But a slow pulse would assist in a negative diagnosis.
- (7) Enlarged joints or rashes were not seen; nor were any advanced cases showing signs of meningitis encountered.
- (8) Gland puncture. This is the final and conclusive test. Blood examination may be helpful, but the routine of gland puncture is always adopted in Mongalla Province.

Under the microscope with the $\frac{1}{4}$ objective, the trypanosomes will be distinguished at once by their active lashing movements. If the slide is left for long, then the movements of the trypanosomes grow slower and they are correspondingly more difficult to see. In one advanced case, six trypanosomes were seen in one field, while again in others, in the earlier stage of the disease, fifteen or twenty minutes' search may be necessary before one is seen.

With the treatment and further progress of the disease I have no experience.

The short notes given above simply indicate the diagnostic points one looks for, when picking out cases of sleeping sickness amongst a native population resident in their villages.

THE DYSENTERIES.

(1) *Amoebic Dysentery*.—This is uncommon: the sparseness of the population and the comparative absence of flies, owing to the lack of horses and cattle, accounts I think for its rarity. The disease exists however in the cattle districts, such as Bor, where flies breed in great numbers.

Treatment consisted of the administration of $\frac{1}{2}$ gr. emetine thrice daily, and mag. sulph. 1 dr. every hour until the tenesmus and blood ceased. This was followed by gradually increasing the time between the doses of mag. sulph., while the emetine was continued, two injections daily for a week, by which time a cure was generally effected.

(2) In the Bor district there is a type of diarrhoea which not uncommonly terminates fatally. Although some of these cases may be amoebic in origin there are certainly others which are due to other causes. Frequent watery stools are passed, with mucus, sometimes tinged with blood, and there are abdominal cramps. On microscopical examination bacilli and flagellates can be seen, the latter showing the characteristic jerky mode of progression. The flagellates are oval in shape, with a single posterior flagellum. Pus cells and blood cells are seen in great numbers. These are probably cases of bacillary dysentery, and the pathogenic effect of the flagellate is doubtful.

Treatment: By calomel and salts, followed by salol, bismuth salicylate and Dover's powder, 5 gr. of each in cachets. This method appears to have good results and many cases have been treated successfully.

FILARIASIS.

Of the different affections due to filaria, enlarged lymphatic glands and elephantiasis are alone commonly seen.

Varicose lymphatic glands in the groin are often apparent when inspecting natives and on each occasion when the blood was taken and examined, microfilariae were found during the day, indicating that probably *Filaria perstans* is the active agent.

Elephantiasis of the legs and scrotum occurs in the Province, but the scrotal type is entirely limited to the Western portion. Elephantiasis of the legs occurs in all districts, but is by no means common and I have only come across five cases in fifteen months.

Those I had the chance of examining showed the presence of *Filaria perstans* in the blood. The cases had the typical gross enlargement, starting below the knee. The deep sulcus in front of the ankle is very difficult to make out owing to the brawny connective tissue overgrowths with its hard rough warty-looking epithelium which covers the entire dorsum of the foot.

I have had no opportunity of treating any cases.

MYIASIS.

Cases of cutaneous myiasis due to *Cordylobia anthropophaga* are fairly common amongst the natives.

SKIN DISEASES.

(1) *Blastomycosis*.—A common affection of the foot and ankle is attributed to this cause. The disease commences usually on the dorsum of the foot and is first seen as a small localized subcutaneous swelling which has a minute external communication through the otherwise unaffected epidermis. If a probe is introduced through the opening it enters a well-marked subepidermal cavity containing pus. If the epidermis is now removed and the pus wiped away a small shallow granulating ulcer is revealed with uneven sinuous edges. These ulcers spread by forming minute subepidermal pockets of pus at the edges of the previous ulceration which in time raises up the skin above it and opens on the surface through another minute aperture.

In this way, shallow irregular ulcerated areas come to be formed, which tend at times to heal in one place, while spreading at another. In course of time the sub-connective tissues are stimulated and the foot becomes enlarged. The ankle sulcus is completely obliterated and the toes become pointed, so the patient cannot put the foot flat on the ground. This overgrowth of connective tissue is hard, dense and unyielding in character, but the epidermis itself is unaffected except where the ulcers appear. These ulcers are always epidermal, and never penetrate to the subcutaneous tissue. After healing has taken place smooth pink scars are left. There is complete absence of pain.

The disease is very slow and chronic and gradually leads to crippling owing to the deformity of the foot.

Treatment: The epidermal abscesses are probed and cleaned. All skin is removed, the ulcers made apparent, and all pockets of pus evacuated. A variety of drugs have proved successful, such as iodoform, an ointment of salicylic acid, ungt. hydr. ammon., and zinc oxide, or B.I.P. ointment. The only method of dealing with the foot deformity is by:—

(1) Amputation, and this I have performed in one case.

(2) Prickly heat, Nile boils and Dhobie itch, occur amongst Europeans and Egyptians.

(3) Madura foot, cutaneous leishmaniasis (Oriental sore) and granuloma inguinale, as far as I know, do not exist.

(4) Jiggers are unknown in Mongalla though they are very prevalent in Uganda.

(5) Keloid: The native tribes indulge largely in the practice of scarifying the skin and rubbing in

irritants in order to form large keloid growths on the face, hands, chest or back.

(6) Ainhum has never been seen.

JUXTA-ARTICULAR NODES.

This condition is extremely common amongst adult natives, men and women being equally affected. The natives have various theories of the causation: that it is always a sequelæ of yaws, that it is due to eating rhinoceros meat, &c. The nodes are usually symmetrical and occur:—

(1) On the extensor aspect of the elbow-joint, usually just below the point of the elbow.

(2) Just below the iliac crests on both sides, or in the neighbourhood of the great trochanter.

(3) On the anterior aspect of the knee-joint, above or below the patella.

(4) Over the ribs, usually behind the mid-axillary line.

The nodes are round conical swellings usually about 2 in. in diameter and projecting for 1 in. They arise in the subcutaneous tissues and can be freely moved on the deep fascia, but are adherent to the deeper layers of the epidermis. On palpation they feel softish with a small hard central core. They are quite painless and cause no inconvenience.

Major Archibald, of the W.T.R.L., Khartoum, kindly examined a tumour which I excised, and reported that it consisted entirely of fibrous tissue. No parasites or fungi were found.

GANGOSA.

This has been mentioned before under the notes on yaws. I have seen only two cases of this condition, and in each there was a previous history of yaws, to which it would appear the disease is due. The lesions heal up rapidly with novarsenobillon. The natives also call the disease yaws.

BRONCHIAL SPIROCHÆTOSIS.

A disease occurs at times which may be due to this cause. It commences in the form of an acute bronchitis, with high fever, pain in the chest, and cough, accompanied with tenacious sputum. The fever is most irregular, and not sustained as in pneumonia. It will range from 97° F. to 105° F. In time the chest condition spreads, until both lungs show râles and rhonchi. Cough is extremely troublesome, and the sputum is now pinkish, while still very tenacious. In the case seen this state of affairs continued for sixteen days, when the cough grew looser, the sputum more copious and less pink, and the physical signs in the chest became less marked. The fever still continued its irregular course, but gradually came down by lysis until the whole condition cleared up.

Diagnosis: From pneumonia it is distinguished by the irregular fever and absence of consolidation; from malaria by the lung condition and blood examination. After several microscopic examinations of the sputum, I was unable to find spirochætes and only a few diplococci.

Treatment: Symptomatic only. Novarsenobillon was given without apparent result. For the cough and fever aspirin and Dover's powder were given

is required, but the disease appeared to run its own course, and the drugs used had no specific action.

PNEUMONIA.

True cases of this disease also occur.

EYE DISEASES.

(1) *Conjunctivitis* is extremely common, owing to the natives' mode of life, and is generally due to a diplo-bacillus.

(2) *Corneal ulcers* occur in all stages of severity, due to abrasions by grass or foreign bodies, combined with dirt, neglect, &c. The sequelæ too are frequently seen: pannus and opacities, anterior staphy-lomata and panophthalmitis.

(3) In young children I have frequently come across a condition of severe conjunctivitis combined with œdema, and marked swelling of the upper lid. The conjunctiva of the upper lid is bright red, and is thrown into folds owing to the œdema. A very copious purulent secretion wells out on everting the upper lid, on which ulcers will often be seen. Externally the swollen baggy appearance of the upper lid is very evident, and the child is unable to open its eyes. The lower lid is but slightly affected.

Treatment: Corrosive sublimate 1 in 8,000 is generally used at first in the treatment of such cases, the eyes being washed out every two hours. Once daily the lids are painted with silver nitrate 2 per cent. Usually patients come in such an advanced stage of infection that several weeks' treatment is required.

(4) *Cataract* is seen occasionally.

(5) *Trachoma* I have never met with, except amongst Egyptians resident in the province.

BOOMERANG BONES.

Cases with the signs of this affection are occasionally seen. The deformity affects the tibia, the fibula, the radius, and the sternum. It appears to be a rarefying osteitis, with softening and bending of the bones, followed by a periostitis and sclerosis, which fixes the deformity. There is the deformity of the tibiae, due to yaws, which is quite different to this, and which produces a *forward* bowing of the bone, "the scab-bard tibia." These boomerang deformities cause bending inward or outward of both tibia and fibula, above the ankle, and bending of the radius and ulna, with corresponding limitation of function. The nodes of new bone are painful on pressure. The cause is unknown. It does not appear to be due to yaws.

Treatment: Novarsenobillon had no effect on the nodes or in relieving the pain, nor drugs such as pot. iod. or sod. salicylate.

MYOSITIS PURULENTA TROPICA.

Met with only in the southern portion of the province near the Uganda border. The natives call it "Ibn." Abscesses appear deep down in the muscles of the leg, thigh, arm or back; they form hard, brawny, extremely painful swellings. I have had no chance of opening an abscess as cases have never been admitted to hospital. Natives say there is no worm

inside the abscess, which they open with a knife when it approaches the skin surface.

BANTI'S DISEASE.

Two cases with the signs of this disease were seen, both in boys about 15 years old. The abdomen becomes extremely prominent, and on examination the spleen and liver are found to be much enlarged. The spleen reaches 6 in. or more below the costal margin and is readily movable. The prominent edge of the liver can be felt 2 in. below the right costal margin, and is tender on pressure. The costal angle is very wide owing to the ribs being splayed out by the growth of the liver and spleen. The patient is pale and anæmic, and the legs and arms appear mere spindles and appendages to the protuberant abdomen. No drug appears to have any effect upon the condition. I have tried intravenous injections of anti-monium tartrate without success.

POROCEPHALUS POMEROYI.

By W. N. F. WOODLAND,

Wellcome Bureau of Scientific Research.

Dr. SAMBON, in a recently-published second instalment of his "Synopsis of the family *Linguatulidæ*" (in this Journal for December 15, 1922, p. 410), has devoted some space to a second attempt to discredit the species of *Porocephalus*—*Porocephalus pomeroiyi*—originally described by me in *Parasitology* (vol. xii, No. 4, January, 1921, p. 337). Pending the issue of a note in the next number of *Parasitology* justifying this new species mainly from the standpoint of the internal anatomy, I may in the meantime point out that Dr. Sambon's supposition (backed up by a highly questionable figure—fig. 19 b, p. 411—(which suggests that the prosoma is visibly composed of annuli) that the "neck" of *P. pomeroiyi* is "only a (temporarily) compressed part of the body, which is found almost invariably (!) in female specimens belonging to this species and may be longer or shorter, involving a variable number of the anterior body-rings immediately following the cephalothorax, or at a short distance from it"—is altogether untenable. Serial longitudinal sections of the female specimen originally described by me prove that the long "neck," the long saccular (tapering anteriorly) prosoma and the large size of the first two annuli in *P. pomeroiyi* are, contrary to Dr. Sambon's hypothesis, definitely fixed morphological features, definitely correlated with the disposition of the internal organs, and can no more be attributed to contraction and transitory deformation than can the equally well-marked regions in a Polychæte or Crustacean. Even Dr. Sambon will hardly be prepared to maintain that when *P. annulatus* elongates a part of its body, the constricted part will temporarily develop a cuticle three times thicker than the cuticle elsewhere, will dispense with the connective and muscular tissues which largely fill the annuli and will obliterate or push out of position solid organs like the hook-glands!

Further, Dr. Sambon has produced no evidence whatever of the existence of examples of *P. annulatus* intermediate in character between the typical specimens and those which I call *P. pomeroyi*, and until he has done so, mere assertions that such do exist or that other linguatulids ("Kiricephalus" spp., e.g.) exhibit similar deformations, will be judged at their proper value.

I may further remark that I did not, as Dr. Sambon supposes, incline to the "opinion that these conubial linguatulids (the two, male and female, specimens I originally described) might represent two different species," nor did I "suspect duality of species in mere sex dimorphism," but I thought it as well, as a mere precautionary measure, to take the possibility into account, if only to dismiss it.

I may conclude by adding that, even in the most unlikely event of Dr. Sambon being able at some future date to provide tangible evidence that *P. pomeroyi* and *P. annulatus* are merely congenital variations of form of a single species, such evidence would certainly not affect my present contention that, in the light of information now available, these two forms are as specifically distinct from each other as are any other two species of linguatulids belonging to the same genus.

Phlebotomus Flies in Human Pathology (M. Neveu-Lemaire, *Revue Pratique des Maladies des Pays Chauds*, tome i, No. 1, October, 1922).—The author gives an interesting description of phlebotomus flies and their activities. The genus "*Phlebotomus*," which has recently been subdivided into several groups, comprises about forty species which are found in Europe, Asia, Africa and in America.

At the present time the phlebotomus is believed to transmit to man two affections, namely: the three day fever, and the Oriental sore; probably also a third, verruga Peruviana.

The author gives a description of the nature and history of each of these affections.

Natural Trypanosomiasis of the Dog in the Sahara (A. Donatien and L. Parrot, *Bulletin de la Société de Pathologie Exotique*, tome xv, No. 7). The existence in the Sahara of a trypanosomiasis in the domestic dog was recognized for the first time by Ch. Viallette in 1915. In the blood of a dog this author found a trypanosome which resembled very nearly, from the point of view of morphology, the *Trypanosoma berberum*, agent of the debab of dromedaries. Viallette favoured the idea of transmissions from dromedaries to the dog. Experiments to prove this, however, could not be undertaken, and the identity of this trypanosome remained uncertain.

The authors here relate the history of a second case of this kind, which they have been able to observe recently at Touggourt. Experiments with a view to the identification of this parasite by means of immunization, are being carried on, and will be the subject of a later article.

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FEBRUARY 1, 1923.

JENNER.

It seems superfluous to tell what Jenner did, but it is to be hoped it will never be forgotten to pay tribute to his memory. It is well it should be so honoured, because it keeps the fact of vaccination and the good it has done before the public. It seems absurd to the doctors that this should be necessary, but the fact is

that even after one hundred years of education of the people, the truth of the good that has been done is repudiated by many. The doctor finds many of the community around him who flout his teaching, and dare to doubt what science has shown to be established truth as to the good of vaccination. Of all the "opinions" held by a section of the public, none of these so-called opinions now receive a more curt reception than those who object to vaccination against small-pox. Were the doctors to rule the ethics of medicine with power to punish for disobedience, the anti-vaccinator would receive short shrift, and a prison cell would be his habitat. Surely the opinion of the "conscientious objector" to vaccination is the greatest parody on scientific therapy that any government ever gave way to; and a demonstration of the weakness of "State," "Parliamentary," "socialistic" form of government, or whatever it might be called, farcical. We have it in the opinion of the great "so-called founder of the people's liberty," W. E. Gladstone, that in time the doctors shall rule, he—the doctor—shall be the ultimate power in the management of the State. It is a goodly number of years since Gladstone declared that opinion, but even in his own province of adviser to the State in public health the doctor's advice has not the power science and experience show to be imperative. What is known as the lower classes have not shown the doctors to have the power that must come to be theirs; in evidence, the trade unions—which have been rechristened lately as "the sluggards and scoundrels protection societies," as Carlyle named them—are against it. They, in their "wisdom," have wildly declared against it, and they, as the result of the devil teaching within their ranks, are allowed to flout legislation in the face of the doctors. We, the medical authorities concerning public health, are set aside. We do not interfere with the politics of these trade unions and sluggards' protection societies as regards hours of labour, wages, and other "rights" they set up, but when they declare against public health matters the doctors are bound to interfere, and the doctors are not going to lose in the struggle.

In the Far East, in Indian and several other tropical areas, the arrest of small-pox was attempted by employing the scabs, pustules, clothing of those afflicted by small-pox: measures that seem to us to-day to be crude. Cow-pox was brought from England to India after Jenner's discovery by the East India Company's steamers, and from the vivified product in India it was, about the year 1801, carried to Canton, and in the Great Hall of the city was regularly inoculated to Europeans and Chinese. There was great difficulty in keeping the lymph from England active, and frequently whole batches of it were found to be inactive and unserviceable. So from the human arm the lymph was taken, and the same original strain was repeated again and again, until the pustule raised was really abortive. To make up for the slight effects these inoculations had they were multiplied manifold, and as many as a dozen or more insertions were made in

one or both arms. That these were effectual was not proven, and in time it came to be neglected altogether.

To the Philippines lymph was sent from Spain by order of his most Catholic Majesty the King, the Philippines and Brazil being then under the rule of Spain. The lymph was sent from Spain, men being inoculated on the way out to Brazil, and hence later from Brazil to the Philippines, the lymph being kept fresh and active by a continuous chain of insertions during the sea voyages, and hence it reached China, when a fresh and active supply was maintained. It must be remembered that communications were by sailing vessels, and as the voyage from England to India had to pass through two tropical exposures, namely, when passing south along the West Coast of Africa and after rounding the Cape of Good Hope, again in passing through the tropics as the ship sailed north to India, many tubes were spoiled, and the lymph rendered weak or altogether useless. Later still, America sent it from its western shores. Vaccine lymph was carried first by sailing vessel and later by steamer. So China was provided from India, from the Philippines and America. Still the sea voyages were long and the supply skimp, and the chances of its being active lessened or rendered wholly inactive. Lastly, the writer recommended that a vaccine station should be established in Hong-Kong itself, under the régime of the governor and the co-operation of an advanced staff at the civil hospital. Lymph from calves was instituted so that the inhabitants of the island itself and the ships' crews in the harbour could be vaccinated; a vaccine station was developed, and the South of China supplied.

Of the several modes of communicating small-pox, one that prevails in China is the powdered dry scab which is blown up the nostril or nostrils. Another method whereby a healthy person can acquire small-pox with the idea of thereby rendering subsequent attacks less severe is for the healthy man or woman to put on the clothing of a person who had died of small-pox or to sleep in the bed or bed-clothes of the dead patient.

There seems little doubt that small-pox is a universal disease and has been known in tropical countries and was introduced into China probably from India during the third century B.C. In Africa small-pox had been equally ancient, in Egypt and even in Central Africa. In America small-pox is believed to have been introduced by the advent of the Spaniards. The actual cause of the disease is unknown, but it is believed to be spread by the air, hence the scab powdered being blown into the nostril by the Chinese and others, and by the "infection" being conveyed to the respiratory passage by sleeping in a bed where the discharges from the skin have soaked the bed clothes and mattress. There seems little doubt that the small-pox becomes more prevalent as one approaches the tropics and as far as we know vaccination is the only prophylactic to be relied upon. In that case vaccination should be made compulsory, especially in the tropics, and a vaccine service should be established wherever possible. In the tropical

countries, where skin rashes are many, we have to contend against confusing small-pox with varicella, and also to diagnose it from measles, influenza, typhus, and certain hemorrhagic diseases, especially those of a purpuric nature, for even measles and scarlet fever with hemorrhage may be mistaken.

Jenner was born in 1749, at Berkeley, Gloucestershire, England, and in London, whilst a student, he had the advantage of becoming a resident pupil of John Hunter. This may well have been the making of Jenner, for no such great a master was to be found in Europe. He mentioned the matter of his observations of the immunity of milk-maids to small-pox and was advised by Hunter to pursue his studies and investigations. He had inoculated his own boy of 18 months old with cow-pox and he had vaccinated a boy of 8 years old with lymph obtained from the hand of a dairymaid. In 1798 Jenner made his observations public and the fame of his discovery spread with rapidity. In 1802 a grant of £10,000 was made him and again in 1806 a further sum of a like amount, when the College of Surgeons in London definitely pronounced in favour of the Jenner treatment of small-pox.

The prevalence of small-pox and of pock-marked people at the beginning of last century was so common that every woman who was not marked by small-pox was pronounced a "fair woman." One used to think the flattering term meant a fair complexion, blue eyes, pink cheeks, and all the beauty that is attached thereto. Such, however, we know was not the case; and persons who are advocating the good of vaccination will find more heed taken of that statement than of any amount of statistics giving percentages of deaths and pock-marked people, when they understand that a fair woman was declared to be so simply because she possessed the rarity of not being marked with small-pox.

Annotations.

Injection of Lymph subcutaneously as a Protection against Small-pox (C. F. Fearnside, *Indian Journal of Medical Research*, 1920).—The author suggests a method of substituting subcutaneous inoculation of prepared lanolinated lymph for the ordinary scarification method in anti-small-pox vaccination. He obtained better results and less local inflammation. The operation is considered likely to be more antiseptically performed by this method than by the old one. Experiments carried out at the Institute of Preventive Medicine, Guindy, by Dr. Gibson, show that this new proceeding gives only a very small amount of protection, and it is not thought likely that it will replace the old scarification method which has given excellent results for many years.

The Value of Vaccine Therapy versus Tonsillectomy in Systemic Disease of Tonsillar Origin (H. Hays, M.D., F.A.C.S., A. Palmer, A.B., M.D., and T. S. Winslow, B.S., M.D., *Medical Record*, vol. xcix, No. 8,

February, 1921).—The authors emphasize the following points in the study of vaccine therapy:—

(1) Systemic disease is often of tonsillar origin, even when the tonsils are small and show little evidence of disease.

(2) Cultures from the tonsils should be taken in all cases of systemic disease.

(3) Cultures taken from the tonsils, preferably from the supratonsillar fossa, showing any form of streptococcus, should be considered *prima facie* evidence of tonsillar disease sufficient for their removal.

(4) Tonsillectomy is a better procedure than the administration of vaccines unless operation is contraindicated.

(5) A poorly performed operation is no criterion of the value of tonsillectomy. A small piece of tonsil remaining may still keep up the systemic infection.

(6) The value of the vaccine as a curative agent is yet to be proved.

A Note on the Value of Germinating Beans in the Treatment of Scurvy (H. W. Wiltshire, *Journal of the Royal Army Medical Corps*, December, 1920).—The author describes an outbreak of scurvy in the Serbian Army, in which tests were made with fresh lemon juice and germinating beans. Four ounces of lemon juice was given to the patients in one ward and a portion of germinating beans weighing 4 oz. in the dry state was given in another ward. There were thirty-nine patients in the first ward and twenty-seven in the second. The results showed a great difference—70·4 per cent. of the patients treated with beans being cured within four weeks as against 52·4 per cent. of those treated with lemon juice. Using the time taken for the gums to return to the normal, it was 3·1 weeks for bean cases and 3·4 for lemon-juice cases. The author emphasizes the importance of starting anti-scorbutic remedies early during the pre-scurvy stage and avoiding the destruction of anti-scurvy vitamin by over-cooking the food.

A Study of the Sizes of Entamoeba histolytica Cysts amongst Symptomless Carriers in Jamaica (H. H. Scott, M.D., M.R.C.P., F.R.S.E., D.P.H.).—Malins Smith (1918) has shown that the curve obtained by measurement of one thousand cysts of *Entamoeba histolytica* from thirty cases is bimodal, between 7 microns and 8 microns and between 12 microns and 13 microns; while that for *Entamoeba coli* is unimodal, between 16 microns and 17 microns. He also found cases with cysts averaging between 9 microns and 10 microns, but these were very rare. He demonstrated that the two chief strains were the "small," averaging 7·7 microns, and the "ordinary" averaging 12·6 microns, and that in England infections with the former were rare in those who had never been out of the country.

In an examination of a case in Jamaica, the size of *histolytica* cyst most frequently met with was 10·6 microns in diameter, and on several occasions the cysts were even smaller than this. The sizes most frequent at first examinations of cysts (12·6 microns and 13·2 microns) became at the third examination, a week or ten days later, 10·6 microns, and 11·2

microns; and cysts 13.2 microns in size, the numbers of which (viz., twenty-seven and fifteen) were only one less than the most frequent numbers (viz., twenty-eight and sixteen) in the first and second specimens examined, had dropped at the fourth examination to only 8.5 per cent of the cysts found. The reason for this cannot be given. Whether prolonged infection with the cysts of *E. histolytica* leads to their becoming reduced in size, or whether the strain in Jamaica is not the same as the "ordinary" strain found at home, but a little smaller, is mere conjecture and not worth serious consideration with the small data at present available.

Correlation between the Chemical Composition of Anthelmintics and their Therapeutic Values in connection with the Hookworm Inquiry in the Madras Presidency (J. F. Caius and K. S. Mhaskar, vol. x, No. 2, October, 1922).—Propenyl phenols have well-marked anthelmintic properties.

The anthelmintic power is not associated with the unsaturated side-chain, but with the phenol group:—

(a) Substances containing a free phenolic hydroxyl act both as vermicides and vermifuges, and much in the same way as thymol and betanaphthol.

(b) Esterification results in the formation of compounds with little or no anthelmintic value.

(c) Etherification weakens, or even destroys, the vermifugal power, and, in some cases, modifies the vermicial action: (1) The vermicial action of methyl ethers resembles that of thymol or betanaphthol. (2) The vermicial action of methylene ethers resembles that of chenopodium oil.

The Incidence of Intestinal Parasites, especially with regard to the Protozoa, amongst Symptomless Carriers in Jamaica (H. H. Scott, M.D., M.R.C.P., F.R.S.E., D.P.H.).—The author experimented with patients in the hospital at Jamaica for the discovery of intestinal parasites. None of these patients had been admitted to the hospital for intestinal trouble, and therefore no parasites were suspected. The results of the examinations were as follows: Out of 102 patients whose stools were examined, *Entamoeba histolytica* was found in fifteen, or 14.7 per cent.; *E. coli* in forty-eight or just over 47 per cent.; *Giardia intestinalis* in thirty-six, or 35.29 per cent.; *Chilomastix mesnili* in thirteen or 12.74 per cent.; and *B. coli* twice. The stools of each patient were examined nine times each, in order to insure a thorough examination. Of these patients none gave any history of intestinal troubles.

Pure Cultures of Large Mononuclear Leucocytes (Alexis Carrel, M.D., and Albert Ebeling, M.D., *Journal of Experimental Medicine*, vol. xxxvi, No. 4, October, 1922).—Pure strains of mononuclear leucocytes were isolated from the blood of adult chickens and kept in active condition for nearly three months. The cultures were composed of large mononuclear leucocytes

which migrated and proliferated *in vitro* at a slower rate than fibroblasts. The cells had no tendency to form a tissue, as do fibroblasts and epithelial cells. They were much less resistant than fibroblasts.

Differentiation of the large mononuclears into cells assuming the appearance of fibroblasts took place under certain conditions.

The activity of the large mononuclears was increased by embryonic tissue juice and inhibited by homologous serum.

Medicine in Egypt (M. Zeitoun, *Revue Pratique des Maladies des Pays Chauds*, tome i, No. 1, October, 1922).—In this article the authors make a study of the history of the foundation of the School of Medicine in Cairo, and the rôle it played in the medical renaissance in Egypt.

The study is divided into the three periods: French, Egyptian and English.

Classification of Aerobic Non-Sporulating Intestinal Bacilli (Aldo Castellani and Albert J. Chalmers, *Annales de l'Institut Pasteur*, vol. xxxiv, No. 9, September, 1920).—The authors classify the intestinal aerobic bacilli into several genera, basing their classification principally on the action of the various germs on milk, glucose and lactose.

(1) Genus *Alcaligenes* Castellani and Chalmers 1918.—No fermentation of any sugar. Milk is rendered alkaline and is not clotted. *Type Species*: *Alcaligenes faecalis* (Petruschky, 1896).

(2) Genus *Eberthus* Castellani and Chalmers 1918.—Motile bacilli which do not clot milk and do not produce gas in any sugar, though acid fermentation may be present in some of them. *Type Species*: *Eberthus typhosus* (Zopf 1885). Other species, *E. kandiensis* Castellani, *E. talavensis* Castellani, and *E. pritznitsi* Castellani.

(3) Genus *Shigella* Castellani and Chalmers 1915.—Same characters as genus *Eberthus*, but bacilli are non-motile. *Type Species*: *Shigella dysenteriae* (Kruze 1899).

(4) Genus *Lankoides*. Castellani and Chalmers 1918.—Milk clotted. No gas in any sugar. *Type Species*: *Lankoides pyogenes* (Passet 1902).

(5) Genus *Dysenteroides* Castellani and Chalmers 1918.—Milk not clotted. Lactose and other sugars acid but no gas. *Type Species*: *Dysenteroides meta-dysentericus* (Castellani 1917).

(6) Genus *Salmonella* Castellani and Chalmers 1918.—Milk not clotted. Glucose completely fermented. Lactose not fermented. *Type Species*: *Salmonella paratyphi* (Schottmüller 1902).

(7) Genus *Balkanella* Castellani and Chalmers 1918.—Milk clotted. Glucose fermented with production of gas. Lactose not fermented. *Type Species*: *Balkanella coagulans* (Castellani 1916).

(8) Genus *Enteroides* Castellani and Chalmers 1918.—Milk not clotted. Lactose and glucose acid and gas. *Type Species*: *Enteroides entericus* (Castellani, 1907).

Abstracts and Reprints.

FURTHER CLINICAL EXPERIENCE WITH INSULIN (PANCREATIC EXTRACTS) IN THE TREATMENT OF DIABETES MELLITUS¹

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GENERAL CLINICAL RESULTS.

Up to the present time over fifty cases of diabetes mellitus have been treated with insulin, and some have been under treatment continuously for several months. Although the most striking results have been seen in children and young adults, all patients have been benefited by the treatment. Many of the patients have come to the hospital in a state of extreme under-nutrition, suffering from great weakness along with an indisposition to any physical activity. On the first or second day of treatment, if sufficient insulin is given, the urine becomes sugar-free, and on the second or third day ketone-free. These patients become conscious of increasing strength before the end of the first week. From a state which may be one of discouragement or of profound mental depression they become cheerful and interested. Hunger is replaced by appetite; the thirst is lessened; oedema, which is common in these cases, disappears. Patients find they are less irritable, and state that they begin to sleep well. The expression improves; the skin becomes less harsh and dry; even the hair becomes softer; in fact, the patient loses that appearance which characterizes the diabetic. In ten days a very considerable amount of physical vigour is restored. Some patients have been able to return to work after a month of treatment. The patient's weight frequently increases, and this can readily be brought about by supplying food in excess of the calorie requirement and increased amounts of insulin. One patient, aged 16, who had lost 40 lb. during her three years of diabetes, gained 35 lb. in less than four months. Mild infections are favourably influenced; for example, the pain of a chronic pyorrhœa was relieved by treatment: it recurred when the injections were stopped, and was relieved again when they were continued. Simple catarrhal infections are no longer of serious import. During this time the urine can be kept sugar-free and ketone-free. The morning blood sugars are lower and may approach the normal level. Lipæmia was present in a few cases and disappeared with treatment.

GLYCOSURIA.

Probably the condition toward the alleviation of which most attention has been directed in the therapy of diabetes is the glycosuria. While regarding this symptom as being, in most cases, of not more than secondary importance, it is nevertheless one in which

the efficiency of insulin may be most convincingly demonstrated.

We have encountered no cases of diabetes mellitus in which insulin, given in adequate amounts, did not make patients aglycosuric within a remarkably short time, in spite of the fact that they had been excreting large quantities of sugar for months while on a fixed diet, and even in spite of large increases (1,000 calories) in the various foodstuffs. Maintenance of a patient without glycosuria may be a more difficult proposition, and involves a good many factors which will be touched upon later. However, in conjunction with a reasonably well controlled diet on which, without insulin, the patient formerly excreted large quantities of sugar, this has been accomplished for long periods. The dosage of insulin required to effect this has naturally varied in different cases and with various preparations of the pancreatic extract, but as a rule is much less than is required initially to render the patient sugar-free. Certain cases indeed may, after a period of insulin treatment, recover such a degree of tolerance as no longer to require extract to maintain them on a basal diet. The treatment and final outcome of such patients is a most interesting subject for future investigation to determine. We are at present inclined to the opinion that the newly regained tolerance of these patients should be protected for a time by the use of small amounts of insulin. An illustration of some of these points occurs in the case of a man aged 57, who entered the hospital on November 10, 1922. He was placed on a diet of protein 27 gm., fat 116 gm., and carbohydrate 34 gm., and containing 1,288 calories. He remained on this diet for nine days, during the last four of which the sugar excretion was 27 gm. a day. On November 19 the diet was increased for certain reasons to 2,280 calories, and was composed of protein 60 gm., fat 200 gm., and carbohydrate 60 gm. Simultaneously the dose of a certain batch of insulin required to make him sugar-free on the increased diet was calculated and administered on the same day. The result was that the patient has been sugar-free continuously since that time on the same diet, though the dosage has gradually been reduced to half the original amount.

KETONURIA, ACIDOSIS, AND COMA.

In practically all patients accepted for treatment an additional problem has presented itself in the management of varying degrees of disturbed fat metabolism—ketonuria; acidosis, and coma. Ketonuria, associated with glycosuria, clears up when sufficient carbohydrate is burned, and this result can sometimes be brought about by dietetic treatment alone. Under insulin treatment ketonuria is relieved in a striking manner, as in the following case: This patient, who on the previous day excreted 273 gm. of sugar and 670 gm. of ketones, was given one dose of 4 c.c. of a certain preparation of insulin at 7 a.m. The urine was free of sugar at the end of two hours and of ketones in four hours. Sugar was again found in the urine at ten hours after the injection, ketones in eight hours. It is of interest to note here that ketones reappear in the urine two hours before sugar.

¹ Abstracted from the *British Medical Journal*, No. 3,236, January 6, 1923.

Cases of severe acidosis show the same prompt reaction to insulin treatment. Ketones disappear from the urine and blood, the normal alkali reserve of the blood is re-established, and the signs and subjective symptoms of the condition completely disappear.

To those who have previously striven, practically unrewarded, with cases of diabetic coma, one of the most interesting and valuable properties of insulin is its effect upon this condition, the mechanism of which we believe will throw an entirely new light on the intermediary metabolism of the foodstuffs. We have had an opportunity of treating ten cases of complete coma (stage of complete anaesthesia) as well as other cases of coma imminens.

Of the ten cases of complete coma treated four died. The first case of coma was admitted to hospital in February, 1922, and died in April. This case came into the hospital in a state of severe acidosis, markedly emaciated and dehydrated, with a high D/N ratio. Owing to the difficulty in the production of insulin at that time many of the preparations lacked potency and satisfactory treatment was impossible. The patient was treated at intervals with insulin. The acidosis was improved, to return when treatment was discontinued. The case gradually became worse and went into coma; was brought out by large doses of a weak extract; lapsed again into unconsciousness and died when the supply of extract was exhausted. One other fatal case was effectually brought out of coma but died of pneumonia. In the other two cases, one died with sloughing gangrene of the foot, and the other of complete vasomotor failure. In both these cases coma was relieved by insulin treatment. At the time of death the urine of these patients was free of sugar and ketones; the blood sugar and blood ketones were normal, and glycogen was found in the liver and muscles post mortem.

The remaining six cases of coma treated are all living. One has recovered and is now aglycosuric without insulin on a diet about double the basal requirement. The other five patients have remained free of symptoms and the urine free of sugar, and ketones under dietetic treatment and the daily administration of insulin.

We are not prepared, at present, to lay down definite rules for the management of diabetes in coma, for we believe that with greater opportunities for study more satisfactory methods may be devised for treating this as well as other problems in relation to the disease. The use of large amounts of fluids by mouth, by the rectum, interstitially, or intravenously, seems very desirable. Rest, warmth, purgation, and stimulation in suitable amounts seem indicated. Sodium carbonate or bicarbonate presents difficulties in arranging proper dosage and undoubtedly kills when used in excess. There is some evidence of the usefulness of the intravenous injection of glucose as a diuretic in the earlier stages of coma. The fact remains, however, that in the past four years no case entering our wards in advanced diabetic coma has recovered by any of these methods. Though we are aware of a few isolated instances of such having taken place in other hospitals, we believe the opinion is commonly held that such cases are practically hope-

less. Insulin treatment may now be said to constitute an important step in the therapy of this condition. Insulin is administered to these patients either subcutaneously, or intravenously followed by subcutaneous injections. The dose employed has been usually, though not always, far in excess of the requirement, and the danger of a hypoglycaemic reaction is guarded against by sufficient glucose given at the same time. No attention need be paid to the glycosuria at this time, as the object is to correct the disordered fat metabolism and decrease ketone production. The glucose is necessarily given intravenously in advanced coma, and perhaps it is not amiss to warn against the danger of using any but the purest form of glucose and against sterilization at unnecessarily high pressures.

The first evidence of improvement is in the rise of alveolar CO_2 , but the difficulties of getting satisfactory samples of alveolar air from comatose patients leave something to be desired in the way of constancy of results, and so clinical improvement usually is noted first and consists in movements, fluttering of eyelids, &c., response to painful stimuli, &c. At the same time, however, there is reduction of the total ketones in the blood, though this information is usually received too late to be of service. The alkali reserve, as estimated by Van Slyke's technique, is more rapidly determined, and may be used to confirm the clinical impression. It tends to rise toward normal a little later, in our experience, than the reduction in blood ketone bodies, and distinctly later than pronounced clinical signs of improvement.

Probably a considerable number of us have been formerly misled by clinical evidence of apparent improvement in the patient which was not confirmed by laboratory data, and which we subsequently found to be unreliable. But, as well as strengthening our position from a clinical standpoint, the laboratory data also provide definite indications as to the necessity of administering further amounts of insulin or glucose. In the presence of a decided lowering of blood sugar the latter is desirable; while inadequacy of insulin dosage is indicated by failure of the alkali reserve to increase. When laboratory facilities are unavailable, a great deal of valuable information may be obtained by frequent examinations of the urine. Disappearance of sugar from the urine is an indication for the administration of more glucose or possibly the use of epinephrin: while disappearance of the ketones is a most favourable sign.

REACTIONS AND HYPOGLYCAEMIA.

Toxic reactions may follow the injection of an extract of any animal tissue, owing to its content of protein and split protein products. These reactions have been especially severe in the experience of investigators with pancreatic extracts, and have been the chief obstacle to their introduction for clinical use. Some reactions of this type were produced by injections of the extract first used by us. The present product, however, is practically protein-free, so that, with the exception of urticarial eruptions in one, or possibly two, sensitive patients, these occurrences are no longer met with. Insulin administration may be

followed by a reaction of another kind, which is the result of the fall in blood sugar (hypoglycæmia). When a single injection is given to a patient there is a rapid fall of blood sugar which reaches a low point in two to eight hours, and tends to return to the original level in twelve to twenty-four.

While the extent of this fall is dependent in a measure upon the amount of insulin and upon the initial blood sugar level, it cannot be predicted with any great degree of accuracy in an individual patient. In giving a dose, therefore, to render the patient sugar-free it sometimes happens that the blood sugar falls well below the normal level, and this sudden hypoglycæmia is accompanied by a characteristic train of symptoms. When the blood sugar percentage falls to 0.07 per cent. under the influence of insulin, the patient becomes aware of it. He may first complain of hunger, or more often a sense of weakness or fatigue, and, especially if it is his first reaction, he is conscious of some anxiety or of what he calls nervousness, or he may even show the signs of a definite neurosis with loss of emotional control, such as crying spells. Almost constantly present is a feeling of tremulousness; actual tremor is rarely seen. The patient may also have some incoordination for fine movements. Vasomotor phenomena are common: pallor or flushing, sometimes one after the other; a sense of heat or chilliness; almost always a profuse sweat. The severity of these symptoms increases with the hypoglycæmia, and the lowering of the blood sugar near to 0.05 per cent. produces very acute distress or mental disturbances, such as confusion and disorientation. A blood sugar of 0.032 per cent. resulted in a state of coma with hypotonia and loss of deep reflexes. One patient while asleep passed into a low muttering delirium as the blood sugar fell to 0.052 per cent. This was followed by uncontrollable hunger. A blood sugar of 0.053 per cent. in another case was accompanied by weakness, crying, and extreme anxiety. One patient was quite irrational while his blood sugar was around 0.06 per cent. On another occasion he became deaf and had difficulty in articulation. This difficulty in articulation has been seen several times. Others have had only a vague feeling of uncertainty which would have passed unnoticed had they not experienced a previous reaction. In such cases the blood sugar is usually about 0.075 per cent.

These reactions can be relieved by food administration; 50 to 100 c.c. of orange juice has an almost immediate effect in clearing up the symptoms. A better result is obtained with 5 to 25 gm. of glucose given with orange or lemon juice. When a patient is unconscious 1 c.c. of epinephrin (1 in 1,000 solution) should be given intramuscularly, followed by glucose by the mouth. If the patient is not well enough in a few minutes to swallow glucose, it may be given subcutaneously or intravenously. Special nursing precautions should be taken for the detection of reactions when insulin treatment is first started, when a new preparation is given, and when insulin is administered late in the day, as the reaction may occur during sleep. As yet pharmacological assay of the potency of insulin

has not been satisfactory, and to this may be attributed the occasional reactions seen when new preparations are used. However, once a patient has had a reaction he is quick to recognize the onset of the next one, and means may be taken to relieve it. Up to the present time no serious mishap has occurred as a result of these hypoglycæmic reactions, but while this is so it is felt that hypoglycæmia constitutes a real source of danger.

GENERAL DISCUSSION OF RESULTS.

The dosage of insulin is a very important factor in the successful treatment of a patient; on the one hand, we have to fear hypoglycæmic reactions, and, on the other, we know that glycosuria will result when the blood sugar rises above the patient's threshold level for excretion of sugar. It is, therefore, not always easy to adjust the conditions so that there is sufficient insulin present to nullify the post-prandial hyperglycæmia, and yet insufficient to produce a dangerous lowering of the blood sugar. We know, however, that the effect of insulin on blood sugar is not exerted immediately after subcutaneous injection, and therefore we space the injections so that their effect is occurring during the period of assimilation of carbohydrates. This usually means injecting the insulin at, or shortly before, the meal, but instances occur—possibly due to delayed, or too rapid, absorption of sugar into the blood-stream, the use of meals containing too much high carbohydrate food, &c.—in which glycosuria occurs at one time and reaction at another. These, fortunately, are not common, but serve to emphasize the necessity for careful observation of the patient for a period in a hospital before discharging him to the care of his private physician. Further, the initial symptoms of reaction are so specific as to leave no doubt in the mind of anyone who has seen them, and the remedy is, fortunately, easy to apply before there is any real danger.

At the end of the preliminary period of observation on a fixed diet the majority of cases of severe diabetes excrete a fairly constant amount of sugar, and this information is most valuable in determining the actual amount of insulin to be employed in treatment. In certain cases, possibly owing to daily fluctuation in tolerance for carbohydrates, the daily excretion of sugar varies, and it is impossible to determine the initial dose of insulin. In these cases it is advisable, to begin with a moderate dose, gradually increasing it until the desired effect is obtained. The amount of insulin used will depend not only on the carbohydrate tolerance of the patient, but on the height and fixity of the blood sugar level.

Whether we shall in the future permit patients to have higher blood sugar levels than at present seems advisable is a point on which there is conflicting evidence. At present we are inclined to the belief that more successful results are obtained with regard to the general well-being of the patient, clearing up of minor and even major infections, &c., if a normal blood sugar level is aimed at. Owing to the short duration of the effect of insulin it might seem desirable to ingest

the carbohydrates at one particular meal and give the extract in relation to this meal, thus avoiding the number of injections—two to three daily sometimes necessary in the severer cases. This, however, is not the case, as the carbohydrate is apparently stored and burned under the influence of the insulin, and during this period the patient feels like a healthy, normal person, and later, when only fat and some protein is available for burning, he gets a mild ketosis and experiences lassitude or fatigue. In our view a prolongation of the period of action is most desirable, and whether this is to be obtained by slowing the rate of absorption or by more frequent injection is a matter for further study.

After these patients are freed from glycosuria and ketosis and are permitted to use an adequate basal ration they usually feel so well that they demand increased food to satisfy their desire for exercise. In this case we are less particular about spreading the carbohydrate intake throughout the day and usually prescribe an increased amount of carbohydrate with three to four times as much fat at one or possibly two meals, and a corresponding amount of insulin. The same thing may be accomplished by raising the diet instead of decreasing the initial dose of insulin. As the protein is not as efficient as carbohydrate in preventing disordered fat metabolism, the amount of fat which can be given with protein is much less than with carbohydrate. Owing to the high caloric value of fat it seems desirable to raise first the carbohydrate in the diet. When increase in calories is not so urgently required, then protein may be used and fat added in the proportion of 10 gm. of fat to each 8 gm. of additional protein.

In severe diabetics and comatose patients the alterations in metabolism under the influence of insulin are most interesting. They furnish material for a considerable amount of investigation which we hope to report upon later. The study of the respiratory quotient reveals positive evidence of the utilization of carbohydrates. Patients with any considerable carbohydrate tolerance may be expected to produce a certain amount of insulin themselves. This may be mobilized under suitable stimuli, and the initial rise in the respiratory quotient sometimes seen is probably due to this factor. The specific effect following the administration of insulin is almost coincident with the attainment of normal blood sugar levels. Demonstration of the effect of pancreatic extracts in raising the respiratory quotient can best be made on the most severe cases of diabetes mellitus.

Other factors which we must decide in the patient's interests are his most suitable weight and condition of nutrition and the means which shall be employed to attain them, and also to what extent work shall be allowed. Following the principle of low maintenance diets in treatment it seems unwise to allow increases in weight in stout patients, or even marked increases in the emaciated. In the former, reduction of the patient's weight by using insufficient fat in the diet is recommended; in the latter it is felt that some increase in the weight is desirable on account of the associated improvement in the general condition of the patient,

his resistance to infection, &c., even though an increased amount of insulin is required. Work, involving as it does the increased use of foods and consequent drain on the supply of insulin, is not to be regarded as desirable when pushed to excess, and patients are accordingly advised to moderate their usual activities.

Diabetics are perhaps more subject to infections and gangrene than any other class of patients. In such cases a distressingly high mortality has been observed. Without doubt the more recent dietetic treatment has removed many of the terrors of operation, such as coma, and has even aided in the more rapid clearing up of infections for the less severe degrees of the disease. However, many patients lose a great deal of their carbohydrate tolerance when infection is added to their diabetic condition. And further, the infections are more prone to occur in the more severe cases who do not respond favourably to dietetic treatment. For both types of patients insulin furnishes most valuable assistance in treatment in that it keeps the blood sugar normal—an important consideration in the treatment of infection—enables the patient to utilize carbohydrates, and, in consequence, prevents acidosis and removes the danger of post-operative coma. It seems clear that necessary surgical procedures may be undertaken in properly treated cases with practically no more risk than in the normal.

Attention must be paid to various other influences in the treatment of diabetic patients. Symptomatic treatment for minor complications, such as constipation, insomnia, &c., must be carried out. Psychic factors, such as fear, anxiety, and worry, are well known to produce hyperglycemia and glycosuria. The effect of insulin is so specific that these need not be considered as influencing the results of treatment, but, in this as in all other diseases the best results of treatment can be obtained with happy, contented patients.

SUMMARY.

The following is a summary of the results of our investigation:—

(1) Under treatment with insulin in patients who are not otherwise amenable to treatment:

- (a) Glycosuria is abolished;
- (b) Ketones disappear from the urine and the blood;
- (c) Blood sugar is markedly reduced and maintained at normal levels;
- (d) The alkali reserve and alveolar carbon dioxide of patients in acidosis and coma return to normal;
- (e) The respiratory quotient shows evidence of increased utilization of carbohydrates;
- (f) The cardinal symptoms of diabetes mellitus are relieved and the patients show well-marked clinical improvement.

(2) Insulin is a specific in the treatment of diabetic coma.

(3) Certain procedures are suggested as a guide in the administration of insulin.

(4) Hypoglycemic reactions in man have been studied and described.

(5) Hypoglycæmic reactions following insulin are relieved by the administration of carbohydrates and also by the injection of epinephrin.

NOTES ON A CASE OF BRONCHOMONILIASIS.¹

By M. J. PARMANAND.

INFLAMMATORY conditions of the lungs resulting from invasion by fungi are not unknown and may be caused by lower as well as higher fungi; the resulting pathological conditions have been described under the broad term "bronchomycosis." Such cases are often met with in the tropics and unless carefully examined are extremely liable to be mistaken for pulmonary tuberculosis.

Cases of bronchomycosis have been described by Castellani and others and the infection has been definitely proved to have been caused by a lower fungus of the genus *Monilia* or *Oidium* or by higher fungi such as *Mucor*, *Aspergillus* and *Penicillium*. Bronchomycosis is common in Ceylon and is generally due to *Monilia tropicalis* Castellani; and the same fungus may be found in cases coming from Southern India. Castellani has published many cases of bronchomycosis from Ceylon since the year 1905. Colonel Sprawson in 1918 reported from Mesopotamia ten cases of continued fever with pulmonary symptoms caused by a general infection with a fungus of the *Nocardia* genus, whilst a case of pulmonary aspergillosis in a British soldier has been lately described by Col. Mackie. Magrou has recorded a case in France in 1916. In the case in question the infection was from a lower fungus of the genus *Monilia* which is characterized by mycelial threads which are often branched and which contain certain spores which may also be terminal.

History of the Case.—D. T., Hindu, aged 38, and a permanent resident of Bombay, a bill collector by occupation, came with a history of cough and occasional attacks of spitting of blood and irregular fever. He could not definitely trace the date of commencement of his illness, but the first attack of hæmoptysis occurred in the month of August, 1921. Before this date he used to suffer from slight cough off and on, but this did not interfere with his occupation till the first attack of hæmoptysis took place. The cough continued with exacerbations at intervals for the next four months, at the end of which period he began to get irregular high fever. He was treated for this by his doctor and the fever abated but did not leave him completely. This irregular low fever continued for the next three months, during the course of which he had several attacks of hæmoptysis.

With this history one would have expected to see an advanced case of pulmonary tuberculosis. I happened to see the patient for the first time in May, 1922. He was a muscular, able-bodied man, and although he said that he had slightly lost weight,

still, seeing the duration of his illness, he had a good physique and this made me doubt the conclusion I had arrived at after hearing the history, that it was a pure case of pulmonary tuberculosis. Physical examination revealed the presence of small patches of consolidation scattered through the lungs on both sides. Râles were heard all over the chest. No signs of excavation of the lungs were found.

The patient was under observation barely a fortnight when he suddenly developed broncho-pneumonia and died. The quantity of blood in the sputum was never great and occasionally the sputum was only blood-streaked. The sputum when first examined was stained by Ziehl-Neelson's method and showed presence of masses of fungous filaments but no tubercle bacilli. Smears stained with Gram's method showed that the fungus was Gram-positive. Fresh sputum was then collected in a sterile Petri dish and it still showed the same kind of fungus and also groups of yeast-like cells. The mouth was then carefully examined but there were no patches of thrush in his mouth or fauces. The mycelial filaments were more numerous whenever there was more blood in the sputum and they diminished as the sputum became clearer. An attempt was made to isolate and identify the fungus which was believed to be responsible for the disease. Several Petri plates of Sabouraud's medium were inoculated with the sputum; after twenty-four hours numerous large round raised colonies with their centres much elevated grew up, together with the colonies of the many bacterial organisms that were present in the sputum. The fungus colonies were of a dull white colour and had a smooth ivory-like surface, and from sub-cultures made from these, a pure growth from the fungus was made. When touched with a platinum loop the colonies were found to be sticky and dense in consistency, but when some of the water of condensation in the culture tube was even gently splashed on the colonies by shaking the tube, practically the whole of the growth got washed to the bottom of the medium. Microscopically the growth consisted of globular yeast-like cells in which only a few short mycelial filaments were present. Sugar media were then inoculated and the fungus produced acid and gas in glucose, maltose and levulose, but there was no change in galactose, lactose, saccharose, mannite, dulcitol, and dextrin; it caused no change in litmus milk. These sugar reactions are identical with those of *Monilia pinoyi* Castellani, and it is considered therefore that the case was one of pulmonary moniliasis.

**Wanted Second-hand Copies of
Theobald's Monograph of the Culicidæ.
Vols. I, II and III.
Or Vol. III only would be accepted.**

¹ Abstracted from the *Indian Medical Gazette*, vol. lvii, No. 11, November, 1922.

Original Communications.

AN UNUSUAL AND FATAL CASE OF UNDULANT FEVER CONTRACTED IN KHARTOUM.

By R. G. ARCHIBALD, D.S.O., M.D.

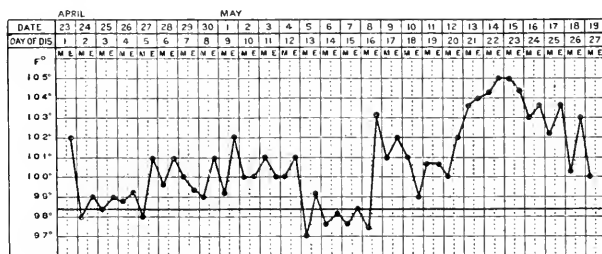
Director, Wellcome Tropical Research Laboratories, Khartoum.

THE patient was an Egyptian soldier, aged about 25, who had resided in Khartoum for a period of twelve months, and, during this time, had apparently enjoyed good health. On April 23 he reported sick, complaining of headache and fever, and was admitted to hospital. His temperature on admission was 102°F .; apart from headache and anorexia he had no other signs or symptoms. His general condition was good, no abnormalities being detected either in the heart, lungs, or alimentary system. For the following three days he had a slight evening rise of temperature (*vide* temperature chart), but on the fifth day following admission to hospital his temperature rose to 101°F . and he complained of some tenderness over the spleen which, on palpation, was found to be slightly enlarged. As malaria was suspected to be the cause of

when low dilutions were employed. In the meantime the patient's condition became worse, the temperature rose to 105°F ., there was slight delirium, and a positive Kernig's sign was obtained.

It was at this stage, viz., the twenty-second day of the disease, that the writer was called in to see the case. The patient was obviously in a toxic state with considerable mental hebetude, temperature 104°F ., pulse 120 per minute, feeble and markedly dicrotic. The conjunctivæ were congested but no photophobia was present nor was there head retraction. A careful examination of the skin revealed no rash. The tongue was very dry and coated with a thick brown fur on the dorsum, while the sides showed raw red areas. The abdomen was slightly distended, and on palpation, an enlarged spleen, tender on pressure, could be readily felt. Clinically, the case might well have passed for an enterica or an atypical typhus infection.

As the serum agglutination tests had failed to assist the diagnosis of the case, it was decided to carry out a blood culture, 10 c.c. of blood being withdrawn with aseptic precautions from a vein and inoculated into a broth flask containing 100 c.c. sterile broth;



the illness, the patient was given a course of quinine treatment by means of daily intramuscular injections. It was not, however, till the eighth day of quinine treatment that the temperature fell, the patient having received during this period a total of 105 gr. of the drug. For the following three days the temperature kept low and then rose to 103°F . and quinine treatment was recommenced. The temperature for the two following days fell by lysis but commenced to rise once more and the patient, at this stage, began to show signs of a toxæmia. Headache had been the predominating symptom throughout his illness; it became more intense as the fever progressed and—as it was associated with definite splenic enlargement, furred tongue, and comparative slow pulse rate—the possibility of an enterica infection was considered. Neither diarrhoea nor constipation were present, the patient having two motions daily. Blood serum was collected on the twenty-first day of the patient's illness and tested by means of Garrod's agglutinator against killed emulsion of *Bacillus typhosus*, *B. paratyphosus* A and B, and also against *B. melitensis*.

The results obtained were negative, the serum failing to agglutinate any of these organisms even

the latter was incubated at 37°C . and subcultures made daily on agar and MacConkey's media.

The first forty-eight hours' incubation of the broth flask yielded negative results, but subcultures, after seventy-two hours, showed on agar very minute clear colonies which formed a delicate growth on the medium. These were examined and found to represent a small Gram-negative coccus whose further cultural characters will be referred to later.

To return to the patient, his general condition became steadily worse and, in spite of medical measures, he died on May 19 after an illness of twenty-seven days. Only a partial post-mortem was carried out, the spleen being removed and sent for laboratory examination two hours after the death of the patient.

On examination, the organ was found to be greatly enlarged with a smooth surface and firm consistency. It weighed 670 grm. ($2\frac{3}{4}$ oz.). On section, it was firm and congested, presenting a consistency very similar to the spleen of kala-azar. The cut surfaces were smooth and of a maroon colour and showed no infarcts.

Smear preparations were fixed and stained for the purpose of demonstrating malarial or other parasites,

with negative results; nor was malarial pigment present. The smears showed a marked preponderance of large lymphocytes and large mononuclear cells, neither myelocytes nor nucleated red cells were noted. The surface of the spleen was also seared with a hot knife, splenic pulp being withdrawn by means of sterile pipettes and inoculated into broth cultures; portions of the spleen were also fixed for histological examination. The broth cultures from the spleen were incubated at 37° C.; subcultures on agar and on broth flasks after forty-eight hours' incubation at 37° C. yielded a delicate growth of minute clear colonies of a Gram-negative coccus.

Histopathology of the Spleen.—Examination of stained sections showed evidence of a general congestion of the organ with a hyperplasia of the lymphoid elements and a marked cellular infiltration composed chiefly of large lymphocytes and large mononuclears particularly around the splenic vessels. Neither protozoal parasites nor pigment were present.

Cultural and other Characters of the Coccus obtained from the Blood and Spleen.—The organism was a minute coccus which did not retain Gram's stain, but stained readily with basic aniline dyes. In young cultures it appeared as a coccus; older cultures, however, showed pleomorphism, cocco-bacillary forms and diplococcal forms being present. Both cocci and cocco-bacillary forms measured about 0.3 micron in diameter. Young broth cultures showed that the cocci possessed active Brownian movement but no movements of translation.

On ordinary culture media incubated at 37° C. growth was slow; indeed this was one of its characteristic features even after repeated subcultures. The addition of human blood to the culture medium expedited the rate of growth. Under anaerobic conditions no growth occurred.

Broth.—After forty-eight hours a general turbidity appeared with a slight flocculent deposit at the bottom of the culture medium.

Agar.—After forty-eight to seventy-two hours, small, dew-like, transparent colonies appeared which increased in size, and when examined by reflected light, were of a clear amber colour, eventually becoming opaque.

Biochemical Reactions.—Neither acid nor gas were produced in glucose, levulose, galactose, rhamnose, maltose, lactose, saccharose, raffinose, dextrin, inulin, starch, salicine, glycerol, erythrol, adonitol, dulcitol, and mannitol.

In litmus milk, a faint alkalinity occurred which was still present at the end of three weeks.

The organism neither produced indol nor a Voges-Proskauer reaction.

Serum Reactions.—The organism having given all the morphological, cultural, and staining reactions of *Brucella melitensis* [1] was further subjected to agglutination tests by specific agglutinating sera supplied from Cairo Public Health Laboratories. It was found that the sera agglutinated the organism up to a dilution of 1 in 1,250 (agglutinating titre of the serum 1,350) which left no doubt that the organism was *B. melitensis*.

Remarks.—The case presented several points of interest and not the least were the difficulties attendant on the diagnosis. It was a case of undulant fever which, according to Hughes, might well be termed "malignant," the whole course of the illness lasting but twenty-seven days. Clinically, it differed from the classical descriptions of undulant fever and from the few cases that the writer has observed in this country. Frontal headache, associated with an irregular type of fever, neither typically continued or remittent, were the predominant signs and symptoms present throughout the illness. Joint pains and swellings, sweats and constipation were absent, and the nervous system was not affected till a few days prior to death. The patient's appearance did not suggest the presence of an existing anaemia, nor was there evidence of blood destruction in the several blood films that were examined throughout the course of the illness.

From a clinical point of view there was every justification for missing the diagnosis. The splenic enlargement and the fall in temperature following quinine treatment, on clinical grounds alone, led to the justifiable diagnosis of malaria; it was only when quinine treatment failed to arrest the continued rise of fever from the nineteenth day onward that the possibility of an organismal septicæmia was considered. The diagnosis of Malta fever, on clinical grounds alone, is difficult; laboratory aid is invariably necessary.

Sir Percy Bassett-Smith [2], in a recent article on undulant fever, states: "Nearly every case of undulant fever has in its early stages been treated for malaria or some pyogenic disease before the correct diagnosis has been made."

In the case under consideration the patient's serum failed to agglutinate—on the twenty-first day of the disease—the laboratory cultures of *B. melitensis*; the latter were subsequently tested against specific melitensis serum and proved quite satisfactory. It is commonly known that agglutinations in undulant fever usually appear about the fifth day of the disease; in this atypical case they were absent on the twenty-first day of the illness and one can infer that there was an entire failure of agglutinin response on the part of the patient.

It was unfortunate that death occurred before an opportunity arose of testing the patient's serum against the organism isolated in the blood.

A low agglutination titre, according to Lamb, Birt and Bassett-Smith, indicates an unfavourable prognosis; the absence of agglutination proved so in this case. No doubt hyperpyrexia detracted from the patient's chances of recovery. Hughes [3] in his excellent monograph draws attention to this sign and considers 103° F. as a danger line.

The patient, as already mentioned, had resided in Khartoum for a period of a year prior to his illness which left no doubt that the disease was contracted in Khartoum; by what agent or means was never established.

Epidemiology of Undulant Fever in the Sudan.—Little is known regarding the epidemiology of what is

looked upon rightly or wrongly as an uncommon disease in the Sudan. Most of the information obtained regarding endemic centres is derived from the hospital returns of the various stations in the Sudan. The writer is of the opinion, however, that the disease is more prevalent than is commonly supposed, and that it is responsible for several of the ill-defined pyrexias of uncertain origin which occur in his country. With this in view it has been the routine custom in the laboratories to test all sera obtained from cases of pyrexia, against *B. melitensis*. Khartoum has hitherto escaped the stigma of being labelled an endemic centre; such centres are known to occur in the Blue Nile, Kassala, Berber, Nuba Mountains, and Bahr-el-Ghazal provinces and the same remark applies to the Red Sea province where the disease was probably originally introduced by pilgrims returning from Arabia.

Source of Infection.—Recent work [4] has shown the close relationship between *B. abortus*, the organism causing bovine abortion, and *B. melitensis* and *B. paramelitensis*. Inquiries instigated by the writer show that bovine abortion does not occur in the Sudan; cattle, therefore, may be ruled out as a potential source of infection. Circumstantial evidence indicates that goats are probably responsible for carrying the infection in the Sudan. In one case reported by Simpson and Birt [5], where infection was contracted in the Blue Nile province, the serum of the goat that supplied the milk to the patient gave positive agglutination with *B. melitensis*. Regrettable as it may seem, no investigations on any complete scale have been carried out to prove in the Sudan to what extent goats are infected.

Most of the towns and villages of the Sudan are dependent on herds of goats for their milk supply, and the prevailing custom of heating or boiling the milk prior to consumption doubtless affords protection to the greater part of the population. Zammit's lacto-reaction might provide interesting information regarding the incidence of the disease in these animals but it should be borne in mind that a lacto-reaction may fail even when *B. melitensis* can be recovered from the goat's milk. Mammitis appears to be the main clinical manifestation among goats. In a recent paper Zammit [6] refers to the tendency to abortion among infected animals.

As a further aid to locating ambulatory cases of *B. melitensis* among the population Burnet's [7] intradermic reaction may prove valuable and indeed might well be tried as a critical test for animals.

The part played by blood-sucking insects in the transmission of the disease should not be ignored, for Errocks and Kennedy proved that *Culex fatigans* and *Aedes fasciata* were capable of transmitting infection to monkeys; this method of transmission and spread might well occur where ambulatory types of the disease are met with.

One must call attention to the fact that medical officers appear to be slow in realizing the importance of bacteriological investigation of the urine of convalescent cases prior to their discharge from hospitals. The neglect of such a procedure may result in soil

infection every time the urine is voided and the spread of infection by the inhalation or ingestion of contaminated dust. A recent theory that infection may occur through the conjunctival sac is one requiring investigation.

Conclusions.—The main points in this paper may be briefly summarized:—

(1) A case of malignant undulant fever contracted in Khartoum, succumbed after an illness of twenty-seven days' duration.

(2) Clinically, the case lacked many of the typical manifestations of the disease.

(3) On the 21st day of the illness no agglutinations for *B. melitensis* were present in the patient's serum.

(4) *B. melitensis* was recovered by hæmoculture on the 22nd day of the disease; it was also obtained from post-mortem cultures of the spleen.

(5) Undulant fever whether due to *B. melitensis* or *B. paramelitensis* is more common in the Sudan than is suspected.

(6) Sero-diagnostic methods are not always reliable; where they fail, resort to hæmoculture, urine culture, or splenic blood culture should be made.

(7) Cases should not be discharged from hospital till repeated bacteriological investigations show the urine to be free from *B. melitensis*.

(8) Bovine abortion does not occur in the Sudan, so that cattle are probably not concerned with the transmission of undulant fever. Goats appear to be likely carriers of the virus, but the possibility of infection by blood-sucking diptera may occur.

Acknowledgment.—Thanks are due to Captain Barry, R.A.M.C., attached Egyptian Army, for the clinical notes of the case.

Khartoum,

January 16, 1923.

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A CASE OF MYOSITIS PURULENTA TROPICA.

By R. L. McCONNELL, M.D.
Uganda Medical Service.

ON June 12, 1922, a native of the Alur tribe was admitted, in my absence, by the medical assistant as a case of rheumatic fever. He complained of very severe pains in all the large joints and back, the elbows and knees suffering most. The evening temperature was in the neighbourhood of 103° F.

On June 18, on my return, he reported that the joint pains had been so severe that he had scarcely slept since admission and that he had also had some swelling and pain in the left chest wall which now felt better. A fluctuating swelling was found there, 4 in. in diameter, with its centre over the eighth intercostal space and a little behind the anterior axillary line. There was also considerable swelling and tenderness over the right shoulder and some below the left great trochanter and extending up to it.

Being a member of a rather wild tribe he showed great distrust of surgical intervention. The abscess on the chest wall was however opened and a considerable quantity of pus evacuated (estimated about $3\frac{1}{2}$ oz.) which was like anchovy sauce in colour (light brownish pink) and had no offensive odour; 5 oz. of light anchovy sauce pus was also taken from deep in the swelling on the thigh.

On June 19 the swelling on the right shoulder was about $3\frac{1}{2}$ in. in diameter extending down to the spine of the scapula and a large quantity of similar pus was removed.

On June 22 tenderness and swelling appeared in the inner and upper aspect of the right thigh, while in the evening he noticed a similar swelling on the right side of the neck over the apex of the lung.

On June 28 he complained that the rheumatoid joint pains showed very little improvement though the opium given at night relieved them, but there was no pain in the sites of the abscesses which had been opened. There was intermittent discharge of pus from the thoracic wound.

On June 24 the swelling in the right thigh had markedly lessened but another deep in the outer aspect of the right buttock appeared.

June 26: A considerable amount of pus was taken from deep in the neck swelling with a trocar and canula but none presented in the buttock. Joint pains persisted but the hands and feet were comparatively free.

June 28: On the inner aspect of the left thigh were found several nodulated areas which were not tender. There was some dullness on percussion in the left chest under the site of the original abscess (which still continued to discharge) and a small channel of communication was found to a retro-costal collection of pus which had no connection with the pleural cavity. This was drained. There was neither pain nor cough.

June 30: The right buttock now showed deep fluctuation, was opened, and 3 in. behind the anterior superior iliac spine and well below it 10 oz. of anchovy sauce pus was found apparently in the gluteus medius.

By July 1 there was no pus from the thorax, and by July 2 none from the buttock, but there was pain throughout the left arm.

On July 4 there was again a swelling in the right neck which extended down to the scapular spine. The exploring needle inserted above near the site of the first opening had not shown pus as a deep opening was made above the spine of the scapula and $5\frac{1}{2}$ oz.

of pus taken away. The area of dullness was still present in the left chest but there was neither pain nor discharge. The left leg was again swollen to the outside of the original abscess there, and on July 5 $7\frac{1}{2}$ oz. of pus were taken from it.

On July 6, as dullness persisted in the chest, the opening in the intercostal muscle was enlarged and $2\frac{1}{2}$ oz. of pus withdrawn. There was a little irritable coughing. Pains in the joints were still present in varying severity.

On account of the disappearance of discharge and discomfort in the buttock abscess the incision had been allowed to close but on account of subsequent swelling it was re-opened on July 9, and 10 oz. of pus found.

On July 18 there was some pain and a small swelling at the anterior end of the eighth right rib, which by July 20 had disappeared. The buttock still continued to discharge a good deal of pus.

The patient now made good progress and put on some weight, but on August 15 he complained of great pain in the caecal region which caused him to keep the right leg drawn up. There was deep tenderness on pressure and the temperature went to 103° F. On August 18 the pain was adjacent to Poupart's ligament and there was a well-marked swelling in the iliac fossa. It was evident a large iliac abscess had formed but he refused operation. On August 19 there was some swelling under Poupart's ligament and to the right of the femoral vessels. In the night, with the aid of friends, he disappeared from the hospital shelter.

He was seen three weeks later on September 9 in his village. He said he had no pain but there was a very hard swelling, not giving fluctuation, extending to 2 in. inside the anterior superior iliac spine. The thigh was still flexed but he could get about a little with the aid of a stick. He was seen again on October 2 and was walking fairly well. The swelling had been largely absorbed but could still be felt.

When again seen on October 28 all traces of this abscess had disappeared.

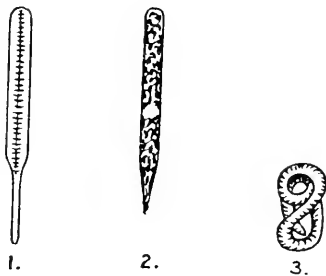
The evening temperature in the early part of the illness was in the neighbourhood of 103° F., and did not reach normal in the mornings. This evening rise was maintained throughout, the height varying with the patient's condition. He had frequent night sweats. The forty-fifth was the first day on which the temperature was completely normal but there was a slight evening rise at times after this and of course the iliac abscess of three weeks later ran it up again.

Filarial larvae were looked for in the blood both by ordinary blood slide and by the concentrated method in both day and night specimens, without success, at the height of his illness and after recovery. Malarial parasites were not found at any time.

On June 21 what appeared to be a nematode larva (fig. 1) was found in a fresh specimen of pus. It was between 55 to 60 microns long and about $3\frac{1}{2}$ microns wide. The anterior end was rounded and the posterior drawn into a pointed cuticular prolongation. The cuticle was cross-striated. The

specimen, owing to other duties, was lost before further details were ascertained.

Later in a stained specimen a similar organism was found which however only measured 45.5 microns by 2.3 microns. It was pointed posteriorly but did not show the narrow prolongation of the fresh specimen. There was a light area at the anterior end and another about the middle. The cuticle was



faintly striated (fig. 2). I sent this specimen together with some of the pus to the Wellcome Research Laboratory, Khartoum, for the favour of an opinion but had not yet had a reply.

On June 30 I thought I detected a small coiled-up worm in the pus, forming an oval perhaps 35 to 40 microns by 25 microns, but I did not measure it or observe details, as in trying to isolate it it got washed away and was not recovered (fig. 3).

FURTHER RESEARCHES ON THE IDENTIFICATION OF INULIN AND MALTOSE, BY A MYCOLOGICAL METHOD. CASES OF MALTOSURIA

By ARDO CASTELLANI and FRANK E. TAYLOR.

In previous publications (1917, 1919, 1920) among which a recent one in the *Biochemical Journal* (1922) we have described a general mycological method, theoretically devised by one of us (C.), some years ago (1904) in Ceylon, which we have found useful in the identification of various carbohydrates and other carbon compounds. We propose in the present paper to describe again briefly how this method can be applied to the determination of inulin and maltose.

INULIN.

It is generally stated that there is no organism which induces a complete fermentation of inulin, that is to say, fermentation with production of gas, but one of us (C.) has found a fungus which causes a complete fermentation of this carbohydrate with large production of gas. This fungus is *Monilia macedoniensis* Castellani and allied species, which ferment with production of gas in addition to inulin the following carbohydrates: glucose, levulose, galactose and saccharose.

By means of this fungus in conjunction with

certain other fungi it is possible to identify inulin, using a modification of the general mycological method we described some time ago for the identification of various sugars.

Technique.—Let us suppose we have a substance about which we want to decide whether it is inulin or not. A sterile 1 per cent. solution in sugar-free peptone water is made and distributed into two tubes, No. 1 and No. 2 each containing a Durham's fermentation tube or similar appliance. The following procedure is then used:—

(a) No. 1 tube is inoculated with *M. macedoniensis* Cast., No. 2 with *M. tropicalis* Cast. The two tubes are placed in an incubator at 35-37° C. for seventy-two hours. If after that time, No. 1 tube contains gas and No. 2 tube does not, we come to the conclusion that the substance is inulin. This is easily understood by keeping in mind the fermentative reactions of the two monilias: *M. macedoniensis* ferments with production of gas, only the following carbon compounds: glucose, levulose, galactose, saccharose and inulin. *M. tropicalis* Cast. ferments with production of gas, only glucose, levulose, maltose, galactose and saccharose.

Monilia macedoniensis Cast. + } = Inulin.
M. tropicalis Cast. 0 }

(b) No. 1 tube is inoculated with *M. macedoniensis* Cast.; No. 2 with *M. rhoi* Cast. The two tubes are placed in an incubator at 35-37° C. for seventy-two hours. If after that time No. 1 tube contains gas and No. 2 does not we can come to the conclusion that the substance is inulin. This is easily understood remembering that *M. macedoniensis* ferments with production of gas, only glucose, levulose, galactose, saccharose and inulin, and *M. rhoi* ferments with production of gas, only glucose, levulose, galactose and saccharose.

M. macedoniensis Cast. + } = Inulin.
M. rhoi Cast. 0 }

(c) No. 1 tube is inoculated with *M. macedoniensis*; No. 2 with *Bacillus pseudo-coli* or *B. neapolitanus*, or any other strain of the communitor group of *B. coli* (ferment saccharose). The tubes are incubated at 37° C. for four days. If then tube No. 1 contains gas and tube No. 2 does not, we can again come to the conclusion that the substance is inulin, since glucose, levulose, galactose or saccharose, would have been fermented also by *B. pseudo-coli* or *B. neapolitanus* or any other strain of the *Coli* communitor group.

M. macedoniensis Cast. + } = Inulin.
B. coli communitor (*B. pseudo-coli* Cast., *B. neapolitanus* Emmerich, &c.) 0 }

(d) No. 1 tube is inoculated with *M. macedoniensis* Cast., No. 2 tube with *B. asiaticus* Cast. The two tubes are placed in an incubator at 37° C. for four days. If after that time No. 1 tube contains gas and No. 2 does not, we can come to the conclusion that the substance according to all probabilities is inulin. This is easily understood by remembering the fermentative reactions of the two organisms. *M. macedoniensis* ferments only glucose, levulose, galac-

tose, saccharose and inulin, with production of gas; whilst glucose, levulose, galactose and saccharose are also fermented by *B. asiaticus*; it must therefore be inulin.

M. macedoniensis Cast. + } = Inulin.
B. asiaticus Cast. ... O }

IDENTIFICATION OF INULIN WHEN PRESENT WITH SOME OF THE MORE COMMON FERMENTABLE SUBSTANCES.

If we suspect that a liquid contains inulin mixed with some of the more usual fermentable substances such as glucose, levulose, maltose, &c., we can find out the presence of inulin in the following manner. The mixture is fermented with *M. tropicalis* Cast.; if, after exhaustion with *M. tropicalis*, the liquid can still be fermented with *M. macedoniensis* with production of gas, the inference is that the liquid contained inulin. Of course, the precaution should be taken of selecting strains of *M. tropicalis* and *M. macedoniensis* with approximately equal fermentative power on glucose, levulose, galactose and saccharose, which carbohydrates they both ferment.

IDENTIFICATION OF MALTOSURIA.

(a) A 1 per cent. sterile solution in sugar-free peptone water is made of the substance which we wish to ascertain whether it is maltose. The solution is distributed into two tubes which are labelled No. 1 and No. 2. No. 1 is inoculated with *M. tropicalis* and No. 2 with *M. macedoniensis* or other monilias of the same group (*M. macedoniensis* or *M. paracalymers*). If after four days' incubation at 37° C. No. 1 contains gas and No. 2 does not, we can come to the conclusion that the substance is maltose. This is easily understood if we keep in mind the biochemical reactions of the two monilias. *M. tropicalis* ferments with production of gas only the following substances: glucose, levulose, maltose, galactose and saccharose. *M. macedoniensis* ferments with production of gas only the following substances: glucose, levulose, saccharose and inulin. The substance we are investigating has been fermented by *M. tropicalis*. It can only be, therefore, glucose, levulose, or maltose, or galactose, or saccharose; but if it had been either glucose, or levulose, or galactose, or saccharose, it would have been fermented also by *M. macedoniensis*. It can only be, therefore, maltose.

M. tropicalis Cast. ... + } = Maltose.
M. macedoniensis Cast. O }

(b) No. 1 tube is inoculated with *M. metalondinensis* and No. 2 with *M. macedoniensis*. The two tubes are inoculated at 37° C. for four days. If, after that time, No. 1 tube contains gas and No. 2 does not, the substance is maltose. This is explained by the fact that *M. metalondinensis* ferments with production of gas only the following carbon compounds: glucose, levulose, maltose, galactose; and *M. macedoniensis* only the following substances: glucose, levulose, galactose, saccharose and inulin. The substance we are investigating has been fermented by *M. metalondinensis*. It can only be, therefore, either glucose or levulose or maltose or galactose; but if it were glucose or levulose or galactose it would have been

fermented also by *M. macedoniensis*. There is only one possibility left—it must be maltose.

M. metalondinensis Cast. + } = Maltose.
M. macedoniensis Cast. O }

(c) No. 1 tube is inoculated with *M. pinoyi* and No. 2 with *M. krusei*. If, after four days' incubation at 37° C., No. 1 tube contains gas and No. 2 does not, the substance is maltose. This is explained by the fact that *M. pinoyi* ferments only three carbon compounds—viz., glucose, levulose, maltose; and *M. krusei* only two, glucose and levulose. The substance being fermented by *M. pinoyi* must be either glucose, or levulose or maltose; but it is not fermented by *M. krusei*. It cannot, therefore, be glucose or levulose, and there remains only one possibility left—it must be maltose.

M. pinoyi Cast. + } = Maltose.
M. krusei Cast. O }

MALTOSURIA.

We have come across several cases of maltosuria. For the detection of maltose, the urine is obtained aseptically by catheter, or if this is not feasible, is collected in a sterile receptacle and distributed at once in sterile tubes, each containing a small fermentation tube. The tubes are sterilized in Koch's stove for thirty minutes twice at an interval of six hours. This, in our experience, is generally sufficient, but at times it is advisable to repeat the sterilization in Koch's stove on two or three consecutive days. The urine should never be autoclaved, as this procedure may alter the composition of the sugars and other carbohydrates present. The urine freshly passed may also be filtered through a Chamberland instead of being sterilized. The tubes of aseptic urine are inoculated with the monilias, as explained above. If it is suspected that maltose is present in conjunction with other fermentable substances, such as glucose, levulose and galactose, the urine is exhausted with *M. macedoniensis*. If, after exhaustion with *M. macedoniensis*, the urine is still fermentable when inoculated with *M. tropicalis* or *M. metalondinensis* or *M. pinoyi*, we can come to the conclusion that the urine contains maltose in addition to other fermentable substances.

Illustrative Case.—Among the several cases of maltosuria we have come across we may quote the following one which we have recently observed: Englishman, aged 47, a tea-planter, now on leave from a tropical country. Has been a heavy beer drinker for many years. He is feeling quite well except that his stoutness makes it difficult for him to go for long walks, and this interferes with his duties. A Fehling reducing substance has been found in his urine several times during the last five years by various doctors, and he has been told that he had glycosuria, and might develop true diabetes. He came to consult one of us some months ago. The urine was Fehling reducing, and was investigated for presence of the following Fehling reducing carbohydrates: glucose, levulose, galactose, maltose, lactose, pentose. The patient passed in our presence urine into two sterile vessels, the urine of the second vessel was distributed

immediately by means of a sterile pipette into five tubes of peptone water (two parts of urine to one of peptone water) each containing a fermentation tube. The tubes were labelled Nos. 1 to 5. No. 1 was inoculated with *M. krusei* Cast., No. 2 with *M. pinoyi* Cast., No. 3 with *M. metalondinensis* Cast., No. 4 with *B. coli* Escherich, and No. 5 with *B. paratyphosus* B. Schottmuller. The five tubes were placed in the incubator at 37° C. for four days. On examination the results were as follows:—

Tube No. 1 (<i>M. krusei</i>)	...	...	...	O
" 2 (<i>M. pinoyi</i>)	...	...	...	+
" 3 (<i>M. metalondinensis</i>)	...	...	...	+
" 4 (<i>B. coli</i>)	...	...	...	+
" 5 (<i>B. paratyphosus</i> B)	...	...	...	+

This result according to our method (*British Medical Journal*, December 29, 1917) means presence of *maltose*. The urine has been gas fermented by *M. pinoyi* and not by *M. krusei*; *M. pinoyi* produces gas only in three carbon compounds we know of—viz., glucose, levulose, and maltose. The urine, therefore, must contain either glucose or levulose or maltose or a mixture of these various sugars, but if the urine contained either glucose or levulose it would have been gas fermented also by *M. krusei*: the sugar present must therefore be maltose. We may add that the result obtained by our mycological method was confirmed by the carrying out of purely chemical methods by a well-known chemist.

Addendum.—For the reader's convenience we annex a table containing the fermentative characters of the various fungi and bacteria we use in our method, and we give also a list of the principal mycological formulæ which we have devised and employed in the identification of various sugars and other carbon compounds. It is essential to use strains with permanent biochemical reactions. Acid fermentation without production of gas is not taken into account.

MYCOLOGICAL FORMULÆ.

INULIN.

<i>Monilia macedoniensis</i> Cast.	...	...	+	= Inulin.
<i>I. tropicalis</i> Cast.	...	...	O	
<i>I. macedoniensis</i> Cast.	...	...	+	= Inulin.
<i>I. rhoi</i> Cast.	...	...	O	
<i>I. macedoniensis</i> Cast.	...	...	+
<i>Bacillus coli-communior</i> (<i>B. pseudo coli</i> , <i>B. neapolitanus</i>)	...	...	O	= Inulin.
<i>I. macedoniensis</i> Cast.	...	...	+
<i>B. asiaticus</i> Cast.	...	...	O	= Inulin.

MALTOSE.

<i>I. tropicalis</i> Cast.	...	...	+	= Maltose.
<i>I. macedoniensis</i> Cast.	...	...	O	
<i>I. metalondinensis</i> Cast.	...	...	+	= Maltose.
<i>I. macedoniensis</i> Cast.	...	...	O	
<i>I. pinoyi</i> Cast.	...	...	+
<i>I. kreusii</i> Cast.	...	...	O	= Maltose.
<i>I. pinoyi</i> Cast.	...	...	+
<i>I. macedoniensis</i> Cast.	...	...	O	= Maltose.

GALACTOSE.

<i>I. metalondinensis</i> Cast.	...	...	+	= Galactose.
<i>I. pinoyi</i> Cast.	...	...	O	

TABLE SHOWING FERMENTATION REACTION OF CERTAIN FUNGI AND BACTERIA.

	Glucose	Levulose	Maltose	Galactose	Saccharose	Lactose	Mannitol	Inulitol	Dextrin	Raffinose	Arabinose	Adonitol	Inulin	Sorbitol	Starch	Glycerol	Inositol	Saltine	Amalgam	Isothiol	Ethyltol
<i>Monilia balcanica</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. krusei</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. pinoyi</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. metalondinensis</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. tropicalis</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. rhoi</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>M. macedoniensis</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>Bacillus coli</i> Escherich	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>B. pseudo coli</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>B. paratyphosus</i> B var. M.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>B. paratyphosus</i> A Schottmuller	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>B. asiaticus</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
<i>B. pseudo-asiaticus</i> Cast.	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

G = gas; O = absence of gas. Simple acid fermentation is not taken into account.

<i>M. melalondinensis</i> Cast.	+	} = Galactose.
<i>M. krusei</i> Cast.	0	
<i>M. macedoniensis</i> Cast.	+	
<i>M. tropicalis</i> Cast.	+	} = Galactose.
<i>M. bronchialis</i> Cast.	0	
<i>M. tropicalis</i> Cast.	+	} = Galactose.
<i>M. macedoniensis</i> Cast.	+	
<i>M. krusei</i> Cast.	0	
<i>B. paratyphosus</i> B Schottmuller	+	

SACCHAROSE.

<i>M. tropicalis</i> Cast.	+	} = Saccharose.
<i>M. melalondinensis</i> Cast.	0	
<i>M. rhoi</i> Cast.	+	} = Saccharose.
<i>M. pinoyi</i> Cast.	0	
<i>M. tropicalis</i> Cast.	+	} = Saccharose.
<i>B. coli communis (sensu stricto)</i> ...	0	
<i>M. tropicalis</i> Cast.	+	} = Saccharose.
<i>B. paratyphosus</i> B Schottmuller	0	
<i>M. macedoniensis</i> Cast.	+	} = Saccharose.
<i>B. coli communis (sensu stricto)</i> ...	0	
<i>B. coli communior</i> ...	+	
<i>M. macedoniensis</i> Cast.	+	
<i>B. paratyphosus</i> B Schottmuller	0	} = Saccharose.
<i>B. coli communior</i> ...	+	
<i>B. coli communis</i> Escherich (<i>sensu stricto</i>)	0	} = Saccharose.
<i>B. neapolitanus</i> Emmerich ...	+	
<i>B. coli communis</i> Escherich (<i>sensu stricto</i>)	0	} = Saccharose.
<i>B. asiaticus</i> ...	+	

LEVULOSE.

<i>M. krusei</i> Cast.	+	} = Levulose.
<i>M. pinoyi</i> Cast.	0	

GLUCOSE.

<i>M. balcanica</i> Cast.	+	} = Glucose.
<i>M. krusei</i> Cast.	0	

INOSITOL.

<i>B. paratyphosus</i> B, var. M. Schottmuller	+	} = Inositol.
<i>B. paratyphosus</i> A, Schottmuller...	0	

CHEMICO-MYCOLOGICAL FORMULÆ.

SACCHAROSE.

Fehling	0	} = Saccharose.
<i>M. tropicalis</i> Cast.	+	

LACTOSE.

Fehling	+	} = Lactose.
<i>B. paratyphosus</i> B Schottmuller	...	0	
<i>B. coli communis</i> Escherich	...	+	

PENTOSE.

Fehling	+	} = Pentose (generally arabinose.)
<i>M. tropicalis</i> Cast. ....	...	0
<i>B. paratyphosus</i> B Schottmuller	...	+	
<i>B. coli communis</i> Escherich	...	+	

+ = gas; 0 = no gas. Simple acid fermentation is not taken into account.

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NOTES ON CAPT. N. CANTLIE'S "DESCRIPTION OF THE DISEASES OF MONGALLA."

IN the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for February 1, 1923, the original article on the "Description of the Diseases of Mongalla," by Captain Neil Cantlie, M.C., M.B., F.R.C.S., is remarkable in more ways than one. We have in

this Journal for many years advocated the publication by practitioners of medicine in the tropics of the diseases they meet with in their daily task. What one finds amongst home-dwelling doctors is curiosity concerning the life of their medical brethren in a tropical country. They want to know what ailments are met with in their ordinary rounds. "Have they measles there? Is scarlet fever prevalent? Are pleurisy, bronchitis, common colds, and the familiar diseases of home life met with?" One, of course, smiles at such seemingly babyish requests and futile inquiries and wonders at the waste of time on such trifles. Sir James Cantlie tells me the President of one of our Colleges visited him within a week after he reached London in 1897, and for an hour and a half got him to tell his daily life in a tropical country. The President did not want to hear about out-of-the-way cases in medicine or surgery, but something much more worth listening to in his opinion. "When did you get up and go to bed? Did you take hot or cold baths? What did you have for breakfast? What was the texture and the amount of clothing you wore? All about luncheon, tea and dinner. How did you travel about from house to house—riding, driving, or by chairs? What are the houses like? Is there good fish to be had? Good or indifferent meat? Was chicken your principal solid food?" etc., and many other questions which, after a long talk, enabled the inquirer to grasp accurately what the environment of life in the tropics, especially to doctor, meant. This article of Captain Cantlie's is more of the nature of a scientific itinerary than anything we have read.

Of the several contributors of descriptive articles of medical surroundings two stand out prominently, Dr. Andrew Balfour and the late Dr. Albert J. Chalmers. Their handling of the subject was an inspiration and a lesson to us all. In days to come their contributions will be sought for by workers in various departments of service, by governors and councillors, by medical men intending to take up practices or who have taken up practices in some use of the many Colonies and Protectorates within the Empire. By epidemiologists for all time, and by historians who require scientific information and not ship-captain-gossip of the usual unreliable type so dear to certain of our insurance companies, and in which their tables used to be founded as to the amount of extra insurance necessary to charge on account of the "unhealthiness of the climate."

In Captain Cantlie's category the diseases are set down in the order of their importance, estimated by their prevalence, their mortality, their invaliding, &c. In thus handling the subject the writer has balanced matters well. He starts with small-pox, that ever-present scourge which haunts Central Africa as it does many other unvaccinated countries. In Central Africa, as in China to-day, the dread of the disease is not acute. When one asked a Chinaman a few years back if he had had small-pox, his answer was "Not yet," and the

natives in their huts in Mongalla to-day allow cases of small-pox to live with the healthy in the same hut. Moreover, there is the question of whether the disease is virulent or of the nature of alastrim, that is, one in which the mortality is low. The difficulty of sound vaccine arises here in Mongalla as it did in earlier times in India and China. The virus, however good at its place of preparation, may degenerate during a sea voyage of several months, and even overland journeys in the tropics produce similar effects. Even in Mongalla, although at Khartoum is an excellent vaccine station, but 1,000 miles away the nature of the climate is such that what must now be regarded as a near-by source of supply is yet too far off owing to the slow river journey to supply a sound vaccine. Captain Cantlie recommends steps to overcome this drawback efficiently. Yaws appears after small-pox as the most prevalent ailment, and some 50 per cent. of hospital patients are found infected. In Mongalla cases are found at a height greater than has been hitherto recorded, viz., some 5,000 ft. and over.

Several interesting conditions and epidemiological facts are emphasized. Amongst these we note "No Europeans, Syrians or Egyptians contracted yaws." The presence of crippling arthritis, tropical ulcers and "the astonishing effects of salvarsan" and the advantages of treatment by intramuscular injection are all brought out and the definite use of Castellani's mixture. Venereal disease in its several forms is shortly remarked upon. Syphilis occurs only in towns, where Arabs and others from northern towns are regarded as the source of infection; in hill districts no syphilis seen; and the possibility of immunity due to the prevalence of yaws in early life should be considered. An excellent differential diagnosis of these lesions from the multitude of ulcers met with serves a useful purpose, and the short account of the bacteriology is practical, and the treatment is worthy of trial. Leprosy exists to a limited extent, but the natives do not resist or dread lepers living alongside of them. The incidence is estimated roughly at 1 leper in every 1,000 of the population.

Guinea worm is common, but only amongst those who drink from "khors or so-called wells. River drinkers do not suffer." Filtration of infected water through a "zeer" or strained through a cloth protects officers and officials. The cyclops, according to Major Archibald, is most prevalent during the rainy season from May to November, as then the natives walk bare-footed through the swamps.

Bilharzia has for the first time been found in three natives in Mongalla in its rectal form. The intermediary host snails have as yet not been found in Mongalla, but the *Planorbis boissayi* snails have been found some 600 miles north of Mongalla at Malakae on the Nile.

The subject of haemoglobinuria is interestingly handled, and quinine haemoglobinuria gone into with creditable judgment. The cases reported possess a

teaching interest owing to the care taken to record the signs and symptoms, treatment and results.

Blackwater Fever.—The case met with in Captain Cantlie's stay in Mongalla was in a European who had been resident for several years in the Sudan and had many malarial attacks. His custom was to take 15 gr. of quinine on two successive days each week; but in the two previous weeks before the last attack he had forgotten to take his dose. He therefore had had no quinine for sixteen days.

The care with which this case is recorded and the comments on the bearing it has on both malaria and blackwater as regards the recurrences of the former and excessive dosage in the latter is a clinical study of value.

As regards "worm disease" natives seem, as is usual elsewhere, especially liable. Cases of ankylostomiasis, *Ascaris lumbricoides*, Strongyloidosis, *Trichuris trichiura*, and Bestode infection (seeing that the natives occasionally eat meat) are recorded. A note by Archibald "that in severe cases of ankylostome infection eosinophilia is absent" is noteworthy.

Sleeping sickness Captain Cantlie does not deal with beyond short notes on the diagnostic points one looks for when picking up cases of sleeping sickness amongst a native population resident in villages. These notes are invaluable contributions to medical officers engaged in itinerant inspections. The infected areas are "closed" and under the efficient control of special sleeping sickness medical officers. This district has been most efficiently guarded and policed and scientifically dealt with by a succession of medical men for several years, and the greatest credit is theirs for their watchfulness, their devotion, and the many lessons that they have given and taught us in regard to the management of frontier guarding. They have been all too silent workers, and their scientific dealings are a fine bit of conscientious devotion in Darkest Africa.

Anaemic dysentery is uncommon. A type of diarrhoea in the Bor district is noted as not uncommonly fatal. The symptoms and signs are probably due to a compound and complex infection which may hinge upon some one or more of the causes of intestinal flux.

Filariasis in its various forms in which it declares its presence is met with in Mongalla—some in one district, some in another.

Myiasis due to *Cordylobia anthropophaga* are fairly common.

Of skin diseases, Blastomycosis of the foot and ankle is common; it is of a slow and chronic character, attended by shallow ulcerative areas with thickenings of surrounding tissues causing local deformity, which may necessitate amputation. Ainhum has not been seen. Jiggers are unknown in Mongalla. Madura foot, oriental sore and granuloma inguinale were not seen during the itinerant journeys.

An observation of great interest is the frequency

of *juxta-articular nodes* in Mongalla. The nodes are usually symmetrical, and occur just below the tip of the elbows; below the iliac crests; near by the great trochanter; above or below the patella; over the ribs at the mid-axillary line. A report by Major Archibald of Khartoum found neither fungi nor parasites in these excised tumours. Of the two cases of gangrene recorded each had had yaws.

Bronchial spirochaetosis infection, judging by signs and symptoms, are met with, although the observer did not meet with spirochaetes in the sputum. Ordinary pneumonia occurs. Of eye diseases, conjunctivitis and corneal ulcers are seen, and a rather exceptional form of oedema and swelling of the upper eyelid, attended by free purulent discharge. Catarrh occurs, but trachoma amongst Egyptians resident in the provinces only.

Boomerang bones are occasionally seen. *Myositis purulenta tropica* (ibu locally), consisting of deep-seated abscesses in various parts of the body, occurs in the southern portion of the province near the Uganda border.

Banti's disease was found represented by two cases in boys of 15 with typical condition of the abdominal organs.

ALDO CASTELLANI.

Innotations.

Cancer of the Rectum in the presence of a Four Plus Wassermann (M. Golob, M.D., *New York Medical Journal*, December 20, 1922).—A patient suffering from a large carcinomatous mass in the rectum, of three years standing, and showing a strongly positive Wassermann reaction, was treated with salvarsan. The rapidity of development of the carcinoma was greatly increased, and the conclusion is drawn that it had been previously held in check by the *Treponema pallidum*.

The Occurrence of the Larvæ of Onchocerca volvulus in the skin of Natives of the Gold Coast (J. F. Corson, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 4, December, 1922).—Twenty-four cases were selected for investigation from prisoners at Seccondree, Gold Coast: of these thirteen had subcutaneous tumours, and fifteen showed skin lichenification. The larvæ in the skin were those of *O. volvulus*. They were present in the skin in all, or in nearly all, cases with tumours of *O. volvulus*.

No clear causal relationship between the larvæ and the conditions of "craw-craw," elephantiasis and lichenification was shown in these cases.

Observations on Dysentery Bacilli of the Sonne Type (S. W. Patterson, M.D., D.Sc., and Miss F. E. Williams, *The Medical Journal of Australia*, November 25, 1922).—Specimens of a bacillus have been found in cases of colitis which constitutes a third

group of dysentery bacilli, other than the Shiga-Kruse and Flexner-Y groups. It is pathogenic for man and animals. Bacteriologically it is easily confused with dysentery bacilli of the Flexner-Y type, but is a slow fermenter of lactose. It is agglutinated in low dilution by Flexner-Y agglutinating sera and up to a dilution of 1:1,600 by the Common Wealth Serum Laboratories' polyvalent dysentery serum, which is made with an antigen containing representatives of this group. In a series of observations of normal and diarrhoeic patients the authors find that agglutination of the patients with this bacillus at a dilution of 1:100 or more may mean that the patient is showing a specific response to that organism.

Growth-promoting Function of Leucocytes (Alexis Carrel, M.D., *Journal of Experimental Medicine*, vol. xxxvi, No. 4, October, 1922).—Leucocyte extracts, like embryonic tissue juice, possess the power of increasing the rate of multiplication of fibroblasts *in vitro*.

Leucocytes secrete substances *in vitro* which also promote cell multiplication.

Peritoneal exudate or connective tissue invaded by leucocytes acquires the power of increasing the rate of multiplication of fibroblasts.

Leucocytes are capable of bringing growth-activating substances to tissue cells. They may have the important function of promoting cell multiplication in the parts of the organism where they accumulate under certain conditions.

The Value of the Complement-fixation Reaction in Gonococcal Infections (Allen S. Walker, M.D., *Medical Journal of Australia*).—A general account is given of an inquiry into the value of the complement-fixation test in gonorrhoea. General concordance is established with the other published work on the subject. A description is given of the salient points in the technique and stress laid on the need for a sensitive method.

The value of the test confirms the clinical findings and directs the attention of the clinician to those cases worthy of more intensive study or treatment. It sheds light on cases difficult of diagnosis and helps in forming an estimate of the prognosis. The author states that he would not feel justified in sanctioning marriage in any patient whose serum fixed complement in the test.

A Case of Sleeping Sickness (T. gambiense) treated by "Bayer 205" (J. W. Stephens and W. Yorke, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 4, December, 1922).—This patient was presumably infected in Northern Nigeria in August, 1921, and had no treatment prior to his arrival in England in March, 1922, although trypanosomes had been found in his blood in January. When first seen in Liverpool on March 9, trypanosomes were found both in the blood and gland juice. He was given subcutaneous injections of 0.45 gm. atoxyl on March 10 to 13, and intravenous

injections of novarsenobillon 0.6 gm. and 0.9 gm. on March 17 and 20, respectively. These injections were attended by considerable rises of temperature which lasted up to March 23.

As a result of this treatment the general condition of the patient rapidly improved, the rashes disappeared, the enlargement of the lymphatic glands almost completely subsided, the weight steadily increased, and trypanosomes could no longer be found in the blood. The pulse, however, remained frequent. Except for two rises to 100° F. on March 27 and April 9, the temperature remained normal until May 14, when it rose to 103° F. Frequent examinations of the blood during this period were negative. On May 28 the temperature rose to 101.2° F., and trypanosomes were found in the blood. On May 30 an intravenous injection of "Bayer 205" 0.5 gm. was given, a second injection of 1 gm. on June 1 and a third of 1.5 gm. on June 3: the temperature fell to normal after the first injection, and has since remained normal. The blood was negative on May 31 and also on June 3, 8, and 27, and the general condition of the patient remained good. No albuminuria developed. On June 27 an intravenous injection of "Bayer 205" 1 gm. was given as a "prophylactic" measure, and since then the patient has remained in good health.

Cholera Acidosis and its Therapy (M. Tsurumi and T. Toyoda, *Archives of Internal Medicine*, vol. xxx, No. 6, December, 1922).—The alkali content of the blood in mild cases of cholera is practically the same as in health. But in the severer, and especially in the very serious cases, a marked decrease of alkali is observed, leading to acidosis.

By the injection of alkali, the blood alkali in cholera cases is generally increased temporarily or permanently; that is to say, the number of drops by the stalagmometer (according to Traube's method) increases. The occasional decrease of the number of drops is believed to be due to the increased acid production in the body and to the great increase of tolerance to alkali in consequence of acidosis in an acute form.

The mortality after the injection of sodium bicarbonate-saline in forty-nine cases was 28.4 per cent., while the mortality in 480 cases in which no alkali was given, but instead saline, or serum, or both, was 42.7 per cent., a difference in favour of alkaline therapy of 14.3 per cent.

The Occurrence of Xenopsylla astia, Roths., in West Africa (A. M. Evans, *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 4, December, 1922).—Collections of rat fleas made at Accra, Gold Coast, during the months August, 1921, to July, 1922, inclusive, were received for identification by Dr. A. Ingram.

Among the April and May samples were specimens of *Xenopsylla astia*, Roths. This species has not, as far as the author is aware, been found hitherto in Africa: it is, therefore, thought desirable to place its occurrence at Accra on record.

Vitamins in Ice Cream (Arthur H. Smith, *Journal of the American Medical Association*, vol. lxxix, No. 26, December, 1922).—Vitamin A was present in the typical samples of ice cream in such concentration that one may conclude that no noteworthy alteration in its potency is caused by pasteurizing or freezing. Normal growth was induced by 1 gm. of the ice cream, and ophthalmia was cured by 0.25 gm., containing 25 mg. of butter fat.

The vitamin B of the ice cream can be accounted for by the equivalent quantity of milk used in it. Freezing had no effect on the vitamin B in the ice cream used. The ice cream, which was made from pasteurized products, contained no significant quantity of vitamin C.

Experimental Polished-rice Disease in Humans (K. Taguchi, S. Hiraisi and F. Kwa, *Japan Medical World*, vol. ii, No. 5, May, 1922).—The symptoms of human polished-rice disease may be summarized as follows. The symptoms which agree with beriberi are sensory disturbances, motor paralysis, decrease of muscle power, abnormality of tendon reflexes, constipation, decrease in amount of urine, anorexia or aversion only for rice, and mild edema. The symptoms which either are not found in beriberi or contrary to beriberi symptoms and found only in polished-rice disease are lowering of body temperature, decrease of pulse rate and decrease of the number of respirations and appearance of the so-called after-dilation of the heart. Beriberi and human rice diseases are not absolutely the same or identical diseases, but from the clinical side the human polished rice disease cannot be distinguished from beriberi. If polished-rice disease can be considered as avitaminosis the human experiments of polished-rice disease give a considerable weight to the theory that the etiology of beriberi is due to lack of vitamin B.

The Prevalence of Yaws in the United States (Howard Fox, *Archives of Dermatology and Syphilology*, vol. vi, No. 6, December, 1922).—Whether yaws was prevalent in the Southern States during the earlier days of slavery appears doubtful. It is a question at all events that can never be settled. Yaws is a rare disease at the present time in the United States, in spite of its great prevalence in certain parts of the West Indies. The majority of the recorded cases have been observed in the northern seaports and have evidently been imported from foreign countries.

Yaws would probably never thrive in the Northern States as it is purely a tropical disease. With modern laboratory aids to diagnosis, and treatment with arsphenamin, the disease could easily be eradicated if it ever obtained a foothold in the Southern States.

A Case of Blackwater Fever (Adam Patrick, M.D., *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 4, December, 1922).—The author describes a case of blackwater fever in which hemoglobinemia was marked. The blood urea was found to be much increased after a short period of anuria.

Abstracts and Reprints.

STUDIES ON SCHISTOSOMIASIS JAPONICA MORPHOLOGY, BIOLOGY AND LIFE HISTORY OF THE CAUSATIVE ORGANISM, *SCHISTOSOMA JAPONICUM* (KATSURADA).¹

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(I) THE EGG-MIRACIDIUM PHASE OF THE LIFE CYCLE.

(1) The fertilized egg of *Schistosoma japonicum* in utero is a lenticular ovoid object about 67 by 50 microns in size and bears a more or less pronounced spine on one side near the anterior end.

(2) The egg of *S. japonicum* found in the faeces is an oval object with an average length diameter of 89 microns while the breadth diameter averages 66 microns. The most satisfactory basis for calculating relative sizes of these eggs is a comparison of the product of the three diameters. Measurements of five hundred mature schistosome eggs from infected dogs gave a unimodal curve of size distribution, with wide limits but a small standard deviation (i.e., ± 1.5). Measurements made by other observers show wide differences, which cannot be accounted for entirely on the basis of host but depend in part on the actual maturity of the egg measured. Such measurements are not accurate indexes of the egg-size since they do not allow for the third dimension.

(3) The egg of *S. japonicum* as found in faeces of infected animals usually contains a mature or nearly mature miracidium. In addition to a simple but efficient excretory system of four flame cells and connecting tubules, the miracidium contains anteriorly an undifferentiated sacculate gut with granular contents and four nuclei. Lateral to the gut is a pair of granular secretory glands with acidophilic reaction, while posterior to the gut is a dense mass of glands with clusters of ducts opening lateral. These latter exude from time to time a mucoid material of basophilic reaction. The larva is thus provided with secretory glands of both basophilic and acidophilic reaction which are probably endowed with proteolytic powers. The germ balls are developed from a generalized germinal mesothelium. Whatever nerve cells are present in the miracidium are found in a central mass with six anterior and six posterior trunks connected with transverse commissures, just ventral to the basophilic secretory glands.

(4) The cilia of the epithelium consist of two groups, an anterior set with cilia graduated off toward the cephalic end, and a posterior set covering the remainder of the organism. The latter are of equal length, undifferentiated, and rather far apart, while

¹ Contributions from the Parasitology Laboratory, Department of Pathology, Peking Union Medical College.

the former are close together and have a decided differentiation, particularly in the posterior elements. The animal is, therefore, heterotrichous.

(5) The phenomenon of hatching is based on two sets of factors, internal and external. Of the former, maturity of the miracidium and increased internal tension are the most important, while hypotonicity and absence of fermentative agents in the medium are the most important of the latter group. Hatching takes place under rather wide limits of temperature. Acidity of the medium soon destroys the larva.

(6) The miracidium escapes through a longitudinal split in the shell usually opposite the spine. After adjusting itself to the medium the larva ascends to within a few millimetres of the surface where it swims around in a typical fashion during a period of sixty to seventy-two hours, which period may be termed the *infective stage*. The movement is that of a free-living organism, with a rapid, straight, forward glide, while it is deflected from its path by any small object, in which event a reversal of direction is effected by a turn-table method. During this active period the animal is a slim elongate object.

(7) The *post-infective period* is one of senescence, during which the miracidium moves about slowly through the water, gradually settling to the substratum as the stored-up energy becomes exhausted. At this period the larva is oval and flattened.

(8) In case the miracidium of *S. japonicum* comes in contact with the specific mollusc host, *Blanfordia nosophora*, it becomes positively attracted to it, and within a short time (varying up to several minutes) attacks the part with which it first comes in contact. Thus a whole colony of miracidia may be almost entirely eliminated from the water by the presence of a few of these molluscs. Although snails containing one infection may be reinfected, it seems necessary for a certain time to elapse before such reinfection is possible.

(9) Analysis of attempts to experimentally infect thirty *B. nosophora* with one miracidia each showed that in the first half-hour nine of these penetrated the foot of the host, eight penetrated the head and neck, six entered the mantle cavity, and seven disappeared under the body. Of this number seven were found on subsequent examination of the water, giving a maximum percentage penetration under controlled conditions of more than 76.

(10) Infection of the snails with miracidia of *S. japonicum* occurs in the upper few millimetres of the water, which probably indicates a delicate adjustment of the phenomenon of infection to the habits of the snail, namely its position at or near the surface of the water.

(II) THE DEVELOPMENTAL CYCLE OF *Schistosoma japonicum* WITHIN THE MOLLUSC HOST.

(1) The course of the fluke has been traced through the snail for a period of forty-seven days while these experimentally infected animals have been compared with naturally infected specimens containing mature cercariae.

(2) The miracidium penetrates the snail at the

point of contact by a head-on boring motion. The mechanical process is aided by the secretion of proteolytic substances from the two types of secretory glands of the miracidium.

(3) Entrance may be effected (a) through the direct route, i.e., by penetration of the gill filaments and direct entry into the blood-stream; or (b) indirectly, by boring through the tissues of head or foot, thereby gaining entrance to lymph sinuses. Actual penetration through the superficial tissues occupies a period of only a few minutes.

(4) The proteolytic glands are present up to about the fifth day.

(5) From about the seventh day the larva loses its differential characteristics and elongates. Meanwhile the worms slowly work backward from the anterior part of head or foot through the lymph spaces surrounding the salivary glands to the region of the nephridia.

(6) After three weeks the larvae have become elongate sacs, about 25 by 100 microns in measurement, and contain within the body cavity the morula stage of the secondary sporocysts. Soon after this some of them reach the lymph spaces still further distad.

(7) By the beginning of the fifth week the larvae have become definitely differentiated into primary sporocysts, reaching 400 microns in length and containing elongating secondary sporocysts. Some of these have reached the lymph spaces near the liver.

(8) At the beginning of the sixth week practically all of the worms have reached the lymph spaces between liver and gonads. By this time the primary sporocysts have ruptured, setting free the secondary sporocysts, while these latter in turn contain the germ balls of the cercarial generation.

(9) At the end of seven weeks the secondary sporocysts measure 40 by 250 microns, and contain cercariae with differentiating tails.

(10) While the larvae which gain entrance to the snail by the direct route reach the liver much sooner than the other group, they mature no more rapidly than those which use the more circuitous path. Contrary to common belief this latter group are able to secure nourishment from the tissues through which they pass previous to their entry into the natural lymph spaces of the mollusc. In the case of the miracidia of *S. japonicum* many more larvae gain entrance through the indirect than through the direct route.

(11) Final differentiation of the cercariae takes place in the lymph spaces of the distal part of the snail. The parasite never breaks through into the hepatic or gonidial tissues except by accident, but remains bathed in the inter-lobular lymph sinuses, which become more and more distended as differentiation takes place.

(III) THE CERCARIA STAGE OF *Schistosoma japonicum*.

(1) While Japanese investigators first described the Cercaria of *S. japonicum*, the first accurate detailed account of the larva was published by Cort (1919).

(2) On reaching maturity within the parent sporocyst in the liver of the snail the cercariae erupt spontaneously and come to lie in the surface film over the mouth of the snail. These eruptions occur sporadically as the motile larvae mature and outgrow their intramolluscan domicile.

(3) Movement on the part of the cercariae consists of four distinct types: (a) the nervous jerky motion of the body with the ventral sucker as a pivot, usually observed in individuals at the surface film; (b) the free-swimming movement in which the caudal furci serve as anterior propellers; (c) the sinking movement; and (d) the "measuring worm" movement.

(4) Variation in measurements of the cercaria is due (a) to differences in maturity, (b) to contraction and extension of the body and tail of the larva together or separately, (c) to differences in nutrition, as well as (d) to intrinsic size variation.

(5) The excretory system is constant for all species of mammalian schistosome cercariae studied. It is, therefore, of generic and not specific value in diagnosing species of cercariae.

(6) The cephalic glands consist of five pairs of cells with contents similar to each other. These glands differentiate early. When first observed in very young cercariae they are mucoid in nature and basophilic in reaction. As maturity is reached they change from basophilic to acidophilic, which condition prevails in the mature cercaria.

(7) The hollow boring spines which crown the openings of the cephalic gland ducts function in drilling microscopic holes through the skin of the invaded mammal. This process is accomplished the more easily because of the proteolytic ferments which are poured out through the duct openings and digest away host tissue.

(8) The genital *anlage* is undifferentiated in the cercaria.

(9) Viable cercariae cover a range of larvae all the way from individuals which have not yet taken up locomotion to those that have been free-swimming for thirty or more hours. Decadation *per se* does not hinder viability, since infection appears to result more from the contact of cercariae in the surface film than from the active swimming movement of the cercaria.

(10) The post-infective stage is a short period during which the cercaria becomes senescent, loses its activity and degenerates.

(IV) THE DEVELOPMENT OF *Schistosoma japonicum* WITHIN ITS DEFINITIVE HOST.

(1) All of the developmental stages of the Oriental blood-fluke from the time of penetration of the cercaria to the sexual maturity of the worms in the portal system have been studied. A continuous series of twenty-four stages has been recognized. For convenience in reference it is proposed to use Greek letters from α to ω inclusive to refer to these stages. Determination of these stages is based on growth and maturity. Stages α , β , γ , δ and ϵ have not been previously described. Stages ζ and η to ψ (male)

correspond in practically all respects to Cort's stages 1 (female or male) and 2 (male) to 18 (male). Only the earlier part of Cort's series 2 (female) to 11 (female) agree stage for stage with our series.

(2) The earliest stage α was found in peripheral lymph nodes (inguinal lymph nodes in the mouse fifty-one and a half hours after infection, and popliteal lymph nodes of the rabbits twenty-three hours after infection). The second stage β was recovered from the inguinal lymph nodes and lung irrigation fifty-one and a half hours and seventy hours after infection of mice, and forty-five and a half hours after infection from the popliteal lymph nodes and lung irrigation of rabbits. All later stages were recovered from liver irrigations, while β to ϵ stages were obtained from the other organs as follows:—

Stage	Animal	Day after infection	Organ	Technic
β	Mouse	2, 3	Inguinal lymph node	Dissection
"	"	2, 3, 4	Lungs	Irrigation; dissection
"	"	3, 4, 5, 6	Pleural cavity	Washing
"	Rabbit	2, 3	Popliteal lymph node	Dissection
"	"	2	Lungs	Irrigation; dissection
"	"	4	Mesenteric vessels	Irrigation
γ	Mouse	3, 4, 5	Lungs	Irrigation; dissection
"	"	4, 5, 6	Inguinal lymph node	Dissection
"	"	4, 5, 6	Pleural cavity	Washing
"	Rabbit	3	Popliteal lymph node	Dissection
"	"	3, 4	Lungs	Irrigation; dissection
"	"	3	Mesenteric vessels	Irrigation
"	"	3, 4, 5, 6	Pleural cavity	Washing
δ	Mouse	5, 6	Lungs	Irrigation; dissection
"	Rabbit	5, 6	Mesenteric vessels	Irrigation
"	"	4	Legs	Irrigation
"	"	4, 6	Spleen	Irrigation
"	"	4, 5	Peritoneal cavity	Washing
"	"	4, 6	Pleural cavity	Washing
ϵ	Mouse	6	Lungs	Irrigation; dissection
"	Rabbit	5, 6, 7, 8	Mesenteric vessels	Irrigation
"	"	8	Peritoneal cavity	Washing
"	"	7, 8	Spleen	Irrigation

(3) Growth of the young worm is dependent on several factors, among which the position in the host with respect to space and nourishment is all-important. Specimens found in lymph nodes on the fifth day after infection in experimental animals were degenerating. Specimens taken from the pleural washings of mice on the sixth day showed degenerative changes. Growth is correlated with the digestive ability of the worm and that in turn depends on the development of the gut. While red-blood cells of the host are commonly found in the young schistosome beginning with the β stage, digestive changes within the gut have not been noted until the worm arrives in the portal system. Maturity of males is dependent on the presence of one or more females in the portal system.

(4) Successive stages of development in experimental animals (mice, rabbits and dogs) furnish the

basis for construction of a *curve of growth* for maturing *S. japonicum* in the definitive host. Starting with the *a* stage, the spread of the curve from minimum to maximum becomes rapidly fan-shape, having a greatest spread from the fourteenth to the nineteenth day, from which time on until maturity the spread becomes slowly less extensive. The series from dogs show slightly more rapid development than that in mice and rabbits, although at the end of the full developmental period the curves coincide.

(5) Sex differentiation is recognizable from the sixth day after infection. Mating has been observed on the seventeenth day, although sexual maturity is not reached until thirty days after infection. After the twenty-eighth day the females mature more rapidly than the males.

(6) The number of testes in mature males is consistently seven. The full number of chromosomes is fifteen. A study of stages in the maturing male sex cells shows that an accessory (X) chromosome is present. After parasynapsis seven tetrads and one diad have been observed. Reduction occurs here, so that one primary spermatocyte receives eight chromosomes while the other receives seven. The X-chromosome is slightly excentric in position and precedes the other chromosomes to the pole. A second division results in secondary spermatocytes, half of which have seven autosomes, while half have seven autosomes and one heterosome. The former group are considered to be male cells, and the later group female cells.

Current Literature.

INDIAN MEDICAL GAZETTE.

Vol. LVII, No. 12, December, 1922.

Therapeutics of Cinchona Alkaloids (R. N. Chopra, M.A.).—Provided that the circumstances are favourable, quinine given orally is as efficacious as by injection as regards prevention of relapses. Intramuscular injections are both simple and safe and should be employed where oral administration is contra-indicated, but it is advisable not to adopt this method as a routine practice. The necrotic and other effects of intramuscular injections of the cinchona alkaloids are perhaps not fully appreciated by the general practitioner.

Quinine is often given in combination with arsenic in the treatment of chronic forms of malaria, especially where the attacks occur at long intervals, and the combination is decidedly more efficient than is quinine alone.

Methylene blue has been used in cases of quartan fever which do not react to quinine and its combination with quinine is said to prevent further attacks.

Exceptional Hernias (J. W. Wanless, M.D.).—The author emphasizes three points to be remembered in operations for the radical cure of inguinal hernia: (1) Indirect hernias are seldom scrotal; (2) the bladder is often in contact with or occasionally

within the sac of an indirect hernia and liable to injury in dissection; (3) in indirect hernias a double sac frequently exists with the bladder fundus in close contact with the lower one and therefore also liable to injury or inclusion by sutures in making the plastic closure. This is particularly the case where there is a weak or attenuated conjoined tendon.

Relapsing Fever in Bhavnagar (B. N. Mehta, M.B.).—In twenty-three cases of relapsing fever occurring in Bhavnagar it was noticed that the first attack lasted from seven to ten days; the first apyretic period lasted from two to seven days, and the first relapse from three to eight days. In no case did a second relapse take place and no death occurred during a relapse.

The crisis was marked with profuse perspiration, with a fall of temperature to below normal. There was extreme weakness after the attack but convalescence was short.

All cases were confirmed by examination of the blood.

Ankylostomiasis in Penang (D. C. Richards).—In cases of ankylostomiasis admitted to the District Hospital, Penang, treatment was as follows: No food after 4 p.m. of day preceding administration of chenopodium; water *ad libitum*. At 8 p.m., 1 oz. of magnesium sulphate in water. At 7 a.m., a single dose of 2 c.c. of oil of chenopodium in two gelatine capsules. At 9 a.m., 1 oz. of magnesium sulphate in water.

As soon as the oil of chenopodium is administered the patient is urged to lie down quietly, preferably on his right side. One or two cupfuls of hot water are given him to drink slowly as this appears to further the action of the magnesium sulphate when it is given.

Any patient showing signs of collapse after chenopodium is immediately given $1\frac{1}{2}$ c.c. of pituitrin intramuscularly. If necessary this is repeated in two hours. All stools are collected in separate receptacles and washed in a sink. This is done by putting the stools in a fine meshed sieve in the sink and letting the water run gently over the stools until the faecal matter is washed away. The residue is then placed in a large, black photographic tray and the worms easily recognized, picked out, and counted. The daily washing of stools is continued until negative results are obtained, usually about the fourth or fifth day.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE, November 8, 1922.

The Administration of Quinine Tablets (Gouzien).—Concerning the previous discussion on the qualities of compressed tablets of quinine, Gouzien regrets that the experience at Brazzaville led to their disuse, and emphasizes their advantages for easy collective treatment. Broquet suggests that good and bad tablets should be discriminated and that the practitioner should test the elimination of the quinine in the urine.

An Epidemic of Parasitic Gastro-enteritis of Sheep in Morocco (Balazet).—An examination of the intestines of forty sheep, which died from parasitic anæmia, showed that the invariable presence of coccidia of the goat in sheep in winter is due to goats often being mixed with herds of sheep.

Strongylosis in Morocco is the same as that met with in France and Algeria; the parasite is often accompanied with *Bunostomum trigonocephalum*.

Anthelmintic treatment has not been satisfactory, consequently prophylactic measures should be enforced to prevent the spreading of the disease, which causes great mortality in cattle.

Treatment of Sleeping Sickness with "189" (M. Blanchard and G. Lefron).—The authors conclude that subcutaneous injections, with one average dose of "189," produces only peripheral sterilization of short duration. The administration of a strong dose gives better results but the local reaction is too severe. A long series of injections produces apparently a lasting sterilization. "189" administered orally is of no value. In patients in the third stage of trypanosomiasis the drug is likely to cause lesions in the optic nerve.

The Intermediate Host of Portuguese Schistoma hematobium (*Planorbis dufourii* Gracils) (Carlos France).—The author has confirmed that a Portuguese planorbis, identified as *Corneus metidjensis* Forbes, is an intermediate host of *Schistoma hematobium* in Portugal. The characteristics of *Planorbis metidjensis* and *P. dufourii* are compared.

Note on a Lettuce Amoeba (Lactuca sativa) (G. Franchini).—The author examined several heads of lettuce cultivated near Bologna, for the presence of flagellates and other protozoa. In some plants bacteria were seen, like cocci or short bacilli, but no flagellates were discovered, and on one occasion only was a common amoeba found in the juice. He succeeded in cultivating the amoeba upon horse-blood-agar (Nöller's medium). A few rare amoebæ had ingested red blood corpuscles, but the phagocytosis of the erythrocytes was not very marked. In the examination of *Lactuca virosa* no parasites were seen.

At Manila (1904) Musgrave and Clegg discovered a particular amoeba (*Amiba lettuce*) which lives and multiplies on the leaves of the plants. It was first cultivated on water and ordinary bouillon, and after on solid media. Experiments were carried out on three monkeys, two of which developed amebic dysentery.

Inoculation of Different Protozoa in the Læter of Euphorbia (G. Franchini).—Following the author's preceding note on the possibility of infecting certain Euphorbia (*E. sautiana* and *pilosa*) with *Herpetomonas ctenocephali* cultures, further investigations carried out in Italy are described. Two *E. iprecacuanha* inoculated with cultures of kala-azar of Indian origin gave positive results. The parasites appeared in the latex fifteen to twenty days after inoculation. An *E. genticulata* was infected with *Herpetomonas musca domestica*. Experiments with oriental sore and flagellates of *Pentastoma ornatum* were negative.

A Note on the Subject of Prophylaxis of Leprosy in France (MM. Gouzien and Abbateucci).—There is a great need in France for a hospital and home exclusively for lepers, to prevent the spreading of Hansen's disease.

Colonials who come to the country already affected mix with the public without being under medical supervision, thus increasing the dangers of infection.

Prophylaxis of Sleeping Sickness in the Cameroons 1920-21 (Ch. Jojot).—Necessary precautions have been taken to prevent the spread of this disease, which is prevalent in most parts of Africa.

In the examination of the cephalo-rachidian liquid and the blood of the inhabitants of Akonolinga 12 per cent. were found to be affected with trypanosomes; 3 per cent. of the inhabitants of Abong m'Bang; and 3 per cent. of the inhabitants of Doumé. The administration of atoxyl and novarsenobenzol gave successful results.

Trypansamide in the Treatment of Sleeping Sickness (G. Lefron and F. Ouzilleau).—The authors give the results of their observations in five cases of sleeping sickness treated with "trypanamide." Subcutaneous injections induced a longer period of sterilization than intravenous, and in one case a dose of 2 gm. (0.04 per kilo) resulted in sterilization of about a year's duration; whereas in the case of 1 gm. sterilization lasted only eighty-four days.

Miss Pearce, of the Rockefeller Institute, in giving the results of experiments carried out in the Belgian Congo, states that single doses of trypanamide varying from 0.3 gm. to 7 gm. cause the disappearance of trypanosomes in less than twenty-four hours, and peripheral sterilization is maintained from three to six weeks.

Medical News.

JAPAN AND CHILD LABOUR.

JAPAN has adopted the Convention of the International Labour Organization of the League of Nations prohibiting generally the employment in industry of children under 14 years of age. This step involves the repeal of the present Japanese law that admits children under the age of 12 to certain light and easy industrial employment.

SIR ALLAN PERRY and Dr. Aldo Castellani have been appointed Joint Medical Advisors to the North Borneo Government.

**Wanted Second-hand Copies of
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Original Communications.

TROPICAL AND NON-TROPICAL AUSTRALIA.

WHITE SETTLEMENT IN TROPICAL AUSTRALIA.

By W. H. W. CHEYNE, M.B., D.T.M. & H.Camb.

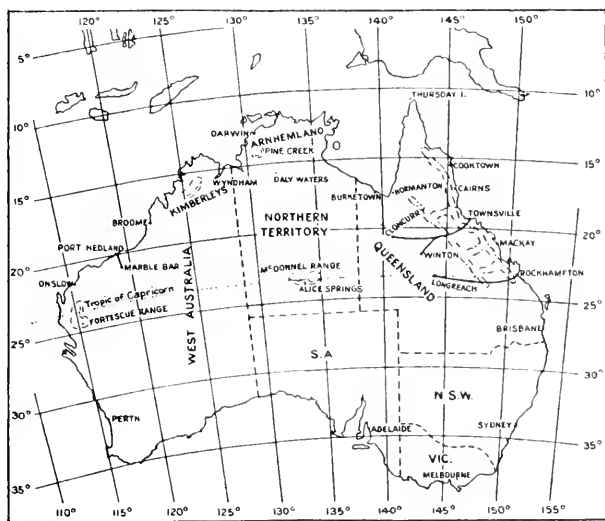
DURING the last century the population of Great Britain has risen from 14 to 42 millions. Already this increase is making itself felt, and, if it should continue at the same rate, the country will eventually be placed in a serious position, unless steps are taken to find an outlet for the surplus population: within the British Empire, if possible.

Of the larger overseas dominions, South Africa, with its native races, does not readily lend itself to a white labouring community. There remain then Canada and Australasia; and it is with Australian conditions, especially the question of permanent white

It must be clearly understood, however, that the division into tropical and non-tropical Australia is largely an arbitrary one, and that the conditions of climate over a considerable area of the more northerly parts of temperate Australia approximate very closely to those found in the tropical zone.

Hitherto, in discussing the suitability or otherwise of tropical Australia for white settlement, sufficient stress has not been laid on the most important point namely, that tropical Australia does not consist of one uniform climate but of two distinct climates, differing markedly from each other, and each sharply defined.

Along the coast of Queensland and the Northern Territory, extending down the west side to the neighbourhood of Broome, is found a tropical climate, as usually understood by the term. The remainder of



settlement in the tropical portions of Australia, that I propose to deal.

Tropical Australia is that portion of the continent which lies north of the tropic of Capricorn. A glance at the map shows that a large part of Queensland and Western Australia, together with the major portion of the Northern Territory, lies within this area. With the exception of Arnhem Land and small parts of the Kimberleys and Cape York, tropical Australia lies south of 15° S. The total area within the tropics is over a million square miles, made up as follows:—

Queensland	...	...	...	359,000
Western Australia	...	...	...	364,000
Northern Territory	...	...	...	426,320
				1,149,320

Northern Australia, including the western coastal belt to the south of Broome, which makes up by far the larger portion, is not tropical in any practical sense of the word, although it happens to lie north of the tropic of Capricorn. As regards the climate it might more justly be called subtropical.

Queensland has a rugged eastern coast sharply separated from the hinterland by mountains. This mountain range is really double, a coastal and an inland range. The coastal chain runs parallel to the sea, distant from five to twenty miles, and rises very abruptly. Its average height is above 2,000 ft., with peaks of considerably higher altitude. The highest point is Mount Bartle Frere, 5,400 ft. north of Innisfail. The great dividing range is further inland. It also is parallel to the coast, running roughly in a

southerly and easterly direction, from about $142^{\circ}5'$ E. at the level of Croydon, 145° at the level of Pentland on the Townsville-Cloncurry Railway, and crossing the Central Western Railway near Jericho, about 146° E.

It is the narrow flat coastal strip together with valleys running some way inland from it which forms the humid tropical belt in Queensland.

Little is known of the geography or climate of the north-west Kimberleys and Arnhem Land, but coastal mountains of some height are found there also.

THE HINTERLAND.

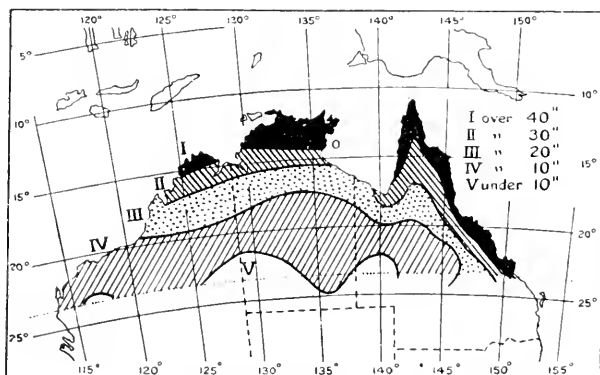
Most of the hinterland is comparatively flat, and on an average under 1,000 ft. It gradually slopes away from the high dividing range. There are however three good-sized plateaus in Northern Australia over 2,000 ft. The best known of these is the Atherton tableland south of Cairns, containing an area of

temperature and a low rainfall: the average is less than 30 in. and in places falls below 10 in.

The prevailing winds form part of the trade belt, and blow steadily for most of the year from S.E. to E. During the wet months, the westerly monsoons blow, and in consequence the rains are more or less monsoonal in character, the chief rainfall occurring during the summer from November to March. Even on the coast the rainfall varies considerably, the Innisfail and Harvey Creek district between Townsville and Cairns having an average of over 140 in. Townsville has an average fall of 49 in. Broome, on the west coast, has under 30 in.

A table and map showing the approximate areas in square miles of Northern Australia with corresponding rainfalls is given below.

	Over 20 in.	Between 20 in. and 10 in.
Queensland	210,000	118,000
Western Australia	105,800	225,000
Northern Territory	180,940	204,490



AVERAGE ANNUAL RAINFALL.

12,000 square miles. It is heavily timbered, largely by a species of pine; which points to an ample and constant rainfall. The temperature is by no means trying, and it is a healthy climate. This plateau is now being closely settled, chiefly by ex-service men, and dairying and mixed farming are successfully carried out.

The only other high lands over 2,000 ft. of any extent are the McDonnell Ranges in Central Australia, an area of about 14,000 square miles; and the Fortescue river area near the West Coast, about 11,000 square miles. Neither of these are at present all settled. It is necessary to grasp these facts, because the climatic conditions and the incidence of tropical disease follow closely the geographical zones.

The coastal belt is a region of moderate temperatures with marked humidity and a large though somewhat irregular rainfall. In the hinterland is found a dry climate with a considerably higher maximum

RAINFALL.

Over a considerable part of the north the rainfall is very variable from year to year. Periods of prolonged drought, succeeded by some years of excessive fall, are by no means unknown in the more westerly regions, making conditions correspondingly difficult for agricultural smallholders without irrigation. The wettest region in Australia is on the eastern edge of the Atherton plateau at Harvey Creek, where the average fall for sixteen years was 165.6 in. In 1901 there fell here 238.45 in. Some remarkable falls in twenty-four hours have occurred along this coast, the highest recorded being 31.53 in. in April, 1911, at Port Douglas, north of Cairns.

As may be expected, the coastal vegetation is luxuriant, and the conditions favour the growth of sugar cane and tropical fruits. Coffee has been grown successfully on a small scale for many years near Cairns. It is in the coastal area that evidence

of tropical disease is to be found, and this will be dealt with later.

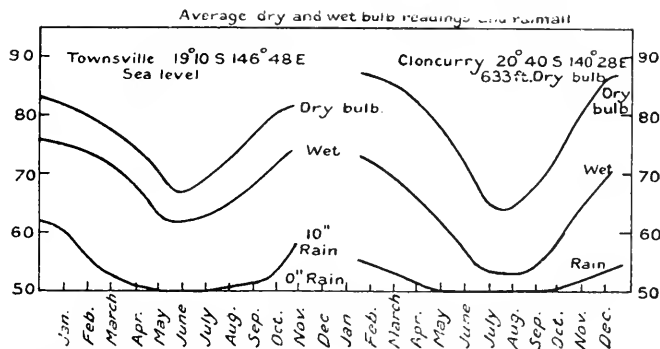
TEMPERATURE.

The thermometer readings, especially the wet bulb, are important from the point of view of comfort and suitability of climate. Hill considers the katathermometer more reliable, as the ordinary wet bulb readings do not indicate heat loss. The katathermometer, however, is too sensitive for use outdoors as its readings are upset by currents of air imperceptible to ordinary observation. Osborne indicated a wet bulb reading of 73° F. as a standard above which discomfort is usually felt. A comparison of the average wet and dry bulb readings on the coast and inland is given below.

Annual fluctuations of mean maximum and minimum temperature follow for Darwin, Daly Waters and Alice Springs.

As a rule the high readings do not keep up for any length of time, perhaps two or three days; but occasional long spells are known. In 1882-3, at Darwin, a temperature of over 90° F. was recorded for thirty-eight consecutive days; in 1901-2, at Marble Bar, a temperature of over 100° F. for sixty-four consecutive days; in 1902-3, at Townsville, a temperature of over 90° for twenty-six days.

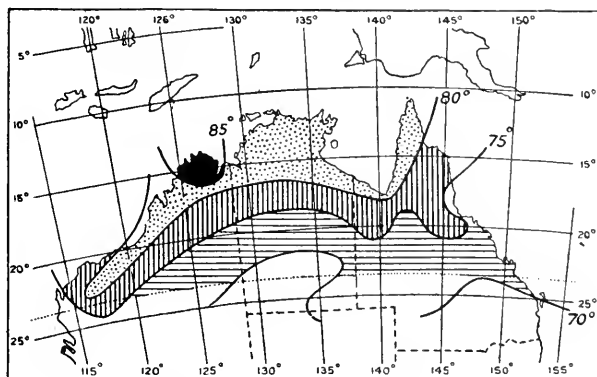
It will be seen that on the Coast the dry and wet bulb readings are close together—in other words there is much atmospheric moisture. Moreover during the summer the diurnal and nocturnal varia-



A table giving average mean temperature readings for the year and for the hottest and coldest months:—

	Average mean temperature			Rainfall in inches	
	Yearly	Hottest month	Cooldest month	Average yearly	Wettest month
Broome ...	79.8	85.9	70.3	23	6
Darwin ...	83	84	77	62	15
Townsville ...	78	82	66	49	11
Daly Waters ...	80	87	69	27	6
Alice Springs ...	70	84	53	11	2

tion is not great, so that the nights are unpleasantly warm; although the heat is to some extent alleviated by the night breeze which regularly blows from the sea. In the coastal belt of the Northern Territory and the Gulf of Carpentaria there is not the same distinction between a hot and cold season as further south. Moreover this high temperature is combined with a marked degree of humidity which makes living uncomfortable.



AVERAGE ANNUAL TEMPERATURE. (After HUNT.)

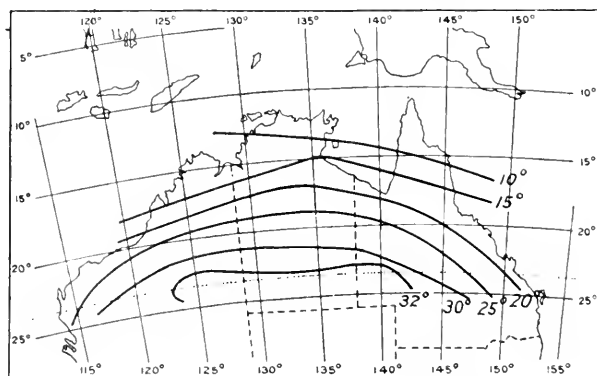
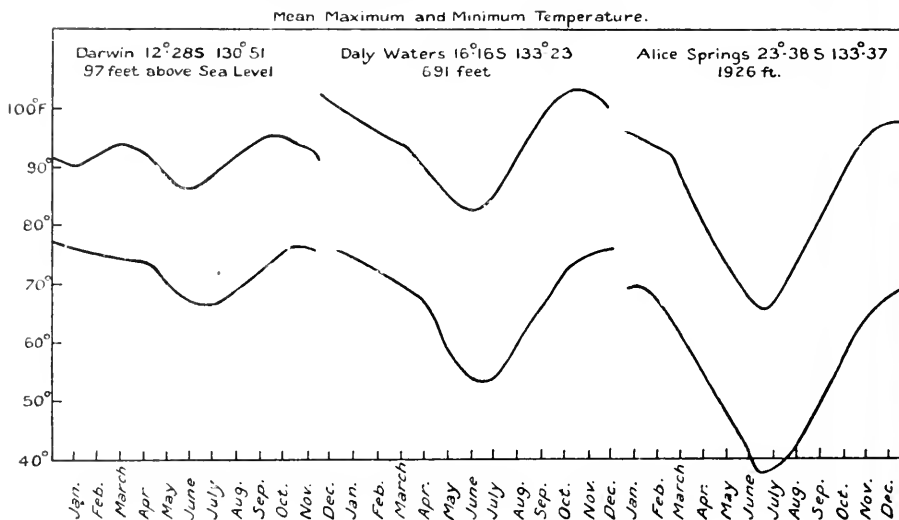
DRY AND WET CLIMATES.

The hinterland is a dry area. This dry belt extends across the continent to the west coast and on this coast as far north as the 90-mile beach (south of Broome).

In summer during the day the temperature in the hinterland is high, often over 100° F.—a temperature

even in summer one needs a covering, while for nine months of the year a couple of blankets are necessary at night. After all, feeling cold is merely a relative matter, and, if there should be a sufficient drop between the day and night temperature, the actual thermometer reading is of secondary importance.

The soil of the hinterland over a considerable area



AVERAGE MEAN TEMPERATURE RANGE. (After HUNT.)

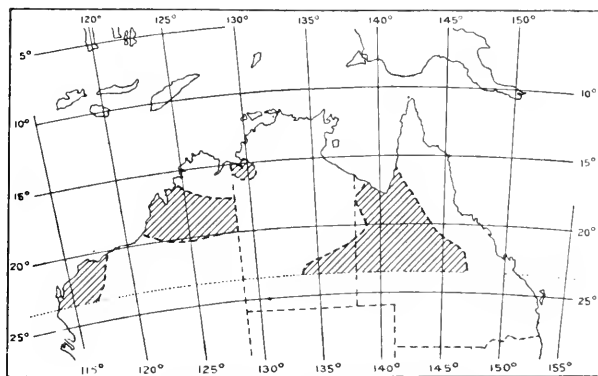
of 120° F. has been recorded at Marble Bar in West Australia (inland from Port Hedland). I have experienced several days of 115° F. in Onslow. This heat however, being dry, is not so trying to most people as 90° F. moist heat. Moreover the temperature falls rapidly after sun-down, and, if sleeping outdoors,

is somewhat sandy (although by no means the desert usually depicted on maps); consequently it heats up quickly during the day and loses its heat rapidly after the sun has gone down.

Except during the rainy season this region is sparsely watered, but overlies a vast artesian area

which consists of several basins. The great artesian basin extends practically over the whole of Western Queensland and into the southerly corner of the Northern Territory. Large artesian basins also are found in the North-west. Possibly these may be

—and its gullies offers plenty of opportunity for water conservation on a large scale. In the central areas during the hot weather evaporation is very rapid; in some places the possible evaporation is greater than the actual rainfall. In making dams



ARTESIAN BASINS IN TROPICAL AUSTRALIA.

found to extend over considerably larger areas when more boring is undertaken in the unoccupied parts of the Territory. Many bores have already been put down, especially in Queensland, some of which have gone to a depth of 5,000 ft., although the average is much less. The water comes up very hot and in places highly mineralized, and although drinkable

therefore care must be taken to have as small a surface exposure as possible and also to guard against wind and direct sunlight by afforestation. Date palms are very suitable for these conditions and in fact have been successfully grown farther south.

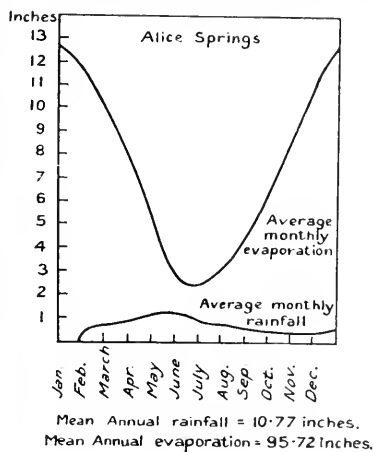
The interior is sparsely timbered and is at present principally devoted to cattle and sheep. With irrigation, however, the soil will grow anything. I have seen in North-west Queensland flourishing gardens with oranges, lemons, figs, grapes, and vegetables which the enterprise of some station owner has grown by pumping water for irrigation from a near-by water hole.

Much of this country also, more especially the mud flats near the West coast, could be adapted for cotton by expenditure on irrigation works. Of recent years cotton growing has been extensively revived all over Queensland.

THE QUESTION OF SETTLEMENT.

The question of the suitability of a country for settlement is a complex one. It is repeatedly brought up by the opponents of the White Australia policy that no white race has ever established itself and thriven in the tropics permanently. Of recent years considerable discussion has centred round a small Dutch community in the Javan seas. A Dutch military settlement was established on the Island of Kisar about 1789, consisting of both men and women of Dutch birth. For many years the garrison was completely forgotten.

In the late nineteenth century the Dutch Authorities made several investigations of the island and its inhabitants who are known as Mestizos. In 1904 a medical examination showed the children to be mentally backward and physically degenerated. Since



man and stock, is not very well suited for vegetation.

However the configuration of the land with its deeply banked river beds—for most of the year merely chains of water holes with dry areas between

that date the Dutch Government has taken anti-malarial measures—malaria being very prevalent on the island—and has supplied the inhabitants with better food. Elkington, who recently visited the island, concludes that a European standard of mentality and physique, without loss of European characteristics of complexion or features, persists in substantial degree after five or six generations. He holds that there is nothing in the available history of these people to show that a tropical climate *per se* has tended to produce degenerative effects or to limit fertility.

Some writers consider that Japanese would be more suitable for Northern Australia, oblivious that the majority of Japanese live in a country at least as cold as Great Britain; if they are capable of acclimatization the white man should be equally so.

To contrast conditions in Northern Australia with India and other parts of the world is not quite fair. In the first place there is no large native population. This is most important because, apart from economic considerations, a large native population provides a reservoir for tropical disease. The numbers of the aborigines left in Australia is not accurately known. At the 1911 census the number of aborigines living near to, or employed by white people was under 20,000 for the whole of Australia. The total number probably does not exceed 100,000, the greater part of whom live in the unexplored regions of Arnhem Land and Northern Kimberleys and will not in any way interfere with settlement.

THE EFFECT OF THE SUN.

A second factor of importance is that undoubtedly the effect of the sun is not as great in Australia as in other tropical countries. Sun-stroke or heat-stroke is extremely rare in Northern Australia and, during two years' residence in the north, I came across one case only and that complicated by alcoholism. In the north it is surprising to see men and children going about wearing felt hats, or indeed sometimes bare-headed, during the middle of the day in the height of summer, apparently with no ill-effects. Moreover, men work outdoors in the sun throughout the day, and the custom of a siesta is not as a rule carried out, although it might be advisable. Osborne states that this shows there is some other factor in the production of heat-strokes besides the sun, and he considers malaria or some infection to be constantly present. But it is true that the strength of the sun's rays varies in different localities equidistant from the equator; whether this is due to some atmospheric difference is uncertain. Watson records that felt hats were worn without ill-effects in Panama under conditions which in Malaya, as his experience indicated, would undoubtedly have produced liability to heat-stroke. This liability may depend more on the degree of atmospheric saturation than on the degrees of temperature.

DISEASES.

The next question to consider is whether there are any tropical diseases which are likely to prove a bar to successful settlement? Again let us bear in mind the division into two climates.

It may be said at once that in the hinterland tropical diseases are practically non-existent, or negligible, with the exception of occasional visitations of dengue which, although an unpleasant is not a fatal disease; moreover it is one easily amenable to modern sanitation, in this case to anti-mosquito measures.

In the coastal zone the position is somewhat different. Malaria, which is such a scourge in most tropical countries, is of but little significance in Australia. Some years ago a number of cases occurred in the vicinity of Cairns but the measures taken on the advice of Breil have been successful in stamping it out. About a year ago there was a sharp outbreak in the Northern Territory at Pine Creek, possibly started by infected miners from New Guinea. In certain parts of the Kimberleys malaria is endemic.

The means of dissemination is present over a large area of Australia. The *Nyssorhynchus annulipes* is the common Anopheline found all over Australia, although several other rarer species have been identified. While it has not been conclusively proved that *Nyssorhynchus annulipes* is the carrier in Australia the probability is that it is so.

The question arises whether there is a possibility of a spread of malaria not only in the tropical but in the temperate regions also. During 1917, 1918, and subsequent years many hundreds of malaria-infected soldiers returned to all parts of Australia from Palestine and other theatres of war, but although there have been isolated indigenous cases reported from widely different centres there has been nothing in the nature of a general outbreak. If it has not occurred by this time it is unlikely to do so now. It is, however, as well for all known cases to be efficiently treated with quinine and to be compelled to use mosquito nets until cured.

The counsel of perfection, namely the extirpation of the anopheline breeding places is not at present practicable, but as settlement advances such measures will gradually be carried out.

The two diseases which do occur to a considerable extent in the coastal belt are Ankylostomiasis and Filariasis. Ankylostomiasis is found all along the East Coast as far south as the northern rivers of New South Wales, but its distribution is somewhat erratic, largely depending on the rainfall.

A survey of the coastal belt from Cooktown, 15°22' S., to Proserpine, 20°21' S., has been made, and the following figures of Lambert, Waite, and Willis, of the Hookworm Commission, show the infection-rate in the different districts:—

	Persons examined	Percentage of hookworm infection	Average annual rainfall inches
Cooktown	852	19.43	72.79
Mossman	986	27.38	81.68
Cairns	8,100	23.23	90.91
Innisfail	3,093	24.21	147.17
Ingham	3,404	31.69	80.72
Cardwell	911	46.15	85.58
Bowen and Proserpine	5,222	6.70	40.27
Ayr	3,630	1.98	43.81
Townsville Schools	2,420	7.56	49.42

the majority
from the orphanages

A comparison between districts of over and under 50 in. rainfall shows:—

Over 50 in.	24.9 per cent. infection
Under 50 in.	2.5 " "

Both *Ankylostoma duodenale* and *Necator americanus* are found, the latter being the more common in the proportion of about four to one (Sawyer). As regards the northern coast the probability is that hookworm is present at Darwin and the coastal settlements; but investigations have not yet been completed. A few cases have been recorded from Derby, West Australia, but in the more southerly dry coastal area no cases are known; in fact the conditions are quite unfavourable for its development.

The hookworm problem is not a simple one to deal with. It is easy enough to establish a diagnosis and to cure the cases for the time being, but the difficulty arises when we come to the prevention of infection, especially among children. Prevention is entirely a matter of dealing with soil pollution; the establishment in country districts of properly constructed privies, and in towns of sewerage systems would in time eradicate the disease. The Rockefeller Institute, working in conjunction with the Federal Government, has for some years been conducting a successful campaign against this disease, but much money and enthusiasm is needed to stamp it out.

The seriousness of hookworm infection lies especially in the mental and physical stunting of children, and this danger has in the past not been sufficiently realized. The people in Queensland, however, are being gradually educated by the Commission through lectures and pamphlets.

Infection with filaria is also somewhat prevalent on the coast, and the complications associated with this disease are not uncommon. In Townsville the infection rate is 5.8 per cent. In Brisbane, which is non-tropical, 15 per cent. of infection is recorded among hospital patients. It must be remembered that many patients come from the north for treatment; these figures, therefore, do not represent the true incidence of the disease in the capital. The control of filaria is not difficult, and its presence is somewhat of a slur on an enlightened white community.

Odd cases of other tropical diseases occur, but are in no sense widespread, such as yaws, sprue, ulcerative granuloma and beriberi.

It must be remembered that Northern Australia is extremely close to tropical islands, carrying very large Asiatic and native populations, which are reservoirs of disease.

The outbreak of plague in Queensland and New South Wales last year shows that quarantine regulations cannot be too strict. Cases occurred first in Brisbane, and spread thence north to Townsville, Cairns, and other coastal towns, and south to Sydney. Although it never reached the dimensions of an epidemic, there were a considerable number of fatal cases.

Dengue, carried by *Culex fatigans* and *Stegomyia fasciata*, is very prevalent at times. More important

is the possibility of the introduction of yellow fever.

Stegomyia fasciata, which is the carrier of yellow fever, is perhaps the commonest mosquito in Australia. It is present all over the east side, both on the coast and inland, as well in the temperate as the tropical areas, and I have found it very common in the Ashburton district of North-western Australia. It has never been seen in the Freemantle district, although specially looked for during an outbreak of dengue. (The three common mosquitoes found in this area are *Nyssorynchus annulipes*, *Culex fatigans*, *Culicella vigilar.*) The danger of the introduction of yellow fever may be thought to be very remote; in these modern days of rapid transit, however, it is quite conceivable that infected mosquitoes or infective patients might in the near future be introduced from the central American zone.

While the patient is only infective for three or four days, mosquitoes have been proved to be infective for at least fifty-seven days. One case might produce an appalling disaster.

Now the carriers of filaria, dengue and yellow fever, namely, *Culex fatigans* and *Stegomyia fasciata*, are essentially house mosquitoes, and therefore correspondingly easy to deal with, as the Americans have repeatedly shown. In Brisbane, some years ago, a campaign on the usual lines was successfully carried out, but lack of enthusiasm prevented the measures from being continued, and conditions became as bad as ever. If an organized campaign were carried out these diseases would become things of the past.

Measures against the malarial mosquitoes, however, are of greater magnitude, as there are large areas of swamps which form breeding places for *Nyssorynchus annulipes*, and these would need to be drained or filled in. The expenditure required is not justified at present, and these radical measures will only be carried out gradually as population increases. In the few endemic areas the spraying of oil on swamps and pools, together with the use of nets and treatment of patients, would help matters.

In the hinterland the only diseases of any consequence due to climate are some cases of trachoma, and sore eyes in general, which are common in children, especially in summer. This is the time there is a plague of flies, and possibly the fly plays an important part in the spread of infection. Many children in the summer months are provided with fly veils, and it would undoubtedly be a good thing if all young children wore them.

Barcoort, which is often seen in the dry belt is a form of the veldt sore so common in South Africa.

Billyandu spew is a peculiar condition in which during a meal a man is suddenly seized with an attack of vomiting, after which he is able to continue his meal. Old hands think it is due to swallowing flies, which is quite likely, considering their ubiquity in summer.

Some diseases of temperate climates are very rare in the hot dry zone. Surgical tuberculosis, rheumatism and rickets are but seldom seen in children living in these parts.

The climate of Western Queensland, in spite of dust storms in summer, is very good for pulmonary tuberculosis. Several medical men who went out there many years ago from England with advanced phthisis are now perfectly well.

To sum up then, over the major part of the north tropical disease is negligible, while on the coast there are only two diseases of any consequence, hookworm and filaria. Moreover, the distribution of hookworm is very patchy, its incidence being more or less confined to certain areas of heavy rainfall. These areas can be avoided until sanitary measures have stamped out the disease.

Dangerous wild beasts such as are found in most tropical countries do not exist in Australia, with the exception of the crocodile, which infests the more northerly rivers. Sharks are extremely plentiful along the coast.

There are a considerable number of snakes all over Australia, some of them very deadly nature. Deaths are not frequent, partly because of the sparse population. The treatment of snake-bite is taught in the Queensland schools.

Before going further, it may be as well to consider shortly what has actually been done in the way of settlement.

In 1911 the population of tropical Australia was 165,420 whites, of whom 157,112 were in Northern Queensland—this number representing about 25 per cent. of Queensland's total population. It will be seen, therefore, that very little settlement has taken place in the Northern Territory or North-west Australia. The area of the Northern Territory is 523,620 square miles, the majority of which lies in the tropics. In 1911 the population of this large area was 3,475 whites. The total area of New South Wales and Victoria is under 400,000 square miles, and in 1911 had a population of over three million.

EFFECT OF ECONOMIC FACTORS.

The preponderance of settlement in Northern Queensland may be largely due to economic factors. There are several flourishing towns on the coast. Rockhampton lies at the terminus of a railway which passes due west about 400 miles, and is a town of about 20,000. Along this railway are a number of small townships, of which Longreach, at the terminus, has a population of about 5,000. These inland towns are chiefly dependent on the pastoral industries carried on around, more especially sheep-farming. Farther north, in latitude $19^{\circ} 20'$, lies Townsville, the principal town in the north, at the end of another long western railway. Townsville has a population of about 20,000, with two large meat works, and an artificial harbour with a very large yearly shipping tonnage.

Still farther north lies Cairns, which is a small but prosperous town, the port of the Atherton tableland, which is being rapidly developed by close settlement.

There are a number of smaller coastal towns chiefly dependent on the sugar-cane industry, which is almost entirely run by whites, among them a considerable number of Italians. Black indentured labour has been for many years barred by the Government.

A considerable mining industry is carried on in the north, especially copper and gold, although gold-mining is largely worked out. Near Cloncurry, in the interior, and in the Chillagoe region—the east coast and much further north—copper mines are successfully worked, entirely by white labour.

The Queensland Government is considering the starting of steel works at Bowen 20° S.; Bowen being selected because of its fine natural harbour and the existence near by of big coal deposits which have hardly been worked.

Along the northerly coast the settlement has been sparse. Normanton and Burketown on the Gulf are small townships which do not go ahead.

In the Northern Territory, Darwin, the capital, is the only place of any size. This settlement was founded many years ago when the country was part of South Australia, but cannot be said to have been a success. Undoubtedly the climate here is trying, both for its humidity and its uniform high temperature. This failure however is very largely bound up with the political history of the Commonwealth.

Turning to West Australia, the settlements are almost wholly confined to the coast. There are three small townships in the wet tropical belt: Wyndham, where there is a big meat-works which unfortunately has not hitherto been successful owing to labour troubles, Derby and Broome. The last is the headquarters of the pearling industry in these parts.

Farther south there are a few small coastal towns, but the climate is very dry and there is a lack of fresh water. Sheep do well a few miles inland on this coast.

The pearling industry is largely run by Asiatics, the divers being Japanese and the boat crews Koepangers (Malays). This labour is indentured and the men are sent home after a certain term. There is, however, a considerable mixed population on this coast.

The reasons for the sparse population of West Australia is partly owing to climatic conditions but largely economic.

In Queensland there is a good service of railways running inland and coastally and also a very efficient and frequent coastal steamer service. On the West Coast railways are non-existent, except for a small line from Port Hedland to Marble Bar, and the steamer communications with the south are extremely poor and irregular. This is partly due to the lack of harbours and to the enormous rise and fall of the tides.

HEALTH.

The question whether the inhabitants of these parts show any loss of health is important. The figures of insurance companies are usually some indication to the morbidity of any climate. Elliot, chief actuary of the A.M.P., states that there is no need for life assurance offices to treat proponents who live in Northern Queensland any differently from proponents living in other parts of Australia, and no loading is required. During some months of medical insurance work in the north I saw no evidence of physical degeneration. Some young men, born and

ered in the north, were as fine examples of physical development as could be found anywhere. In recruiting for the A.I.F. during the war—enlistment being voluntary—the rejection rate for tropical was less than for non-tropical Queensland; but comparative figures for the rest of Australia are not available. The highest reject figure was 19·8 per cent.

In the citizen forces there was a substantially smaller proportion of rejects for tropical as compared with non-tropical Queensland; and for 1918-19 the proportion of rejects was less than the average for all Australian military districts.

Senior cadets showed a slightly greater proportion of rejects than the average for the rest of Australia. Junior cadets had a smaller percentage of rejections than in non-tropical Queensland, but slightly larger than the average percentage over all other military districts.

In 1916, however, the percentage of rejections for junior cadets was less than that in Tasmania, New South Wales and Victoria. In 1918 it was less than New South Wales, Victoria and South Australia.

The death-rate, averaged over twelve years, for the whole of Queensland—separate figures for the north not being available—was slightly lower than the rest of the Commonwealth.

Queensland	Rest of Commonwealth
10·23	10·7

This estimate is open to the objection that a considerable number of elderly people retire to the South and die there.

The infantile mortality and death-rate compares very favourably with this country:—

1913	England and Wales	Scotland	Queensland
Death-rate ...	13·8	15·5	10·39
Infantile mortality	108	110	63·35

and the birth-rate for Queensland in 1915 was 29·35 per thousand. If, however, we take Knibbs' index of mortality we get a clearer idea of what is actually happening. The figures relate to 1915.

Age	Population	Deaths	Deaths per 1,000 in average group	Age-distribution per 1,000 of standard population	Index of mortality
Under 1 year	18,577	1,301	70·03	25·5	1·79
1-10	281,439	1,012	3·60	398·0	1·43
10-20	225,091	1,219	5·42	269·6	1·46
20-30	122,043	1,509	12·36	192·3	2·38
Over 30 years	39,860	2,518	63·17	114·6	7·24
	687,010	7,559	11·00	1,000·0	14·30

A considerable amount of work has been done on physiology in Northern Australia, especially by Breinl and Young, but with very inconclusive results. This work was performed on the coastal belt at Townsville. Observations on rectal temperatures show that during rest there is no variations from the temperatures found

in temperate regions. Slight muscular activity, however, causes a considerable rise of temperature, and this rise is sustained for a longer period than in cold climates. Breinl made a large number of experiments on dock labourers under actual working conditions—the temperature being taken rectally in all cases. His conclusion is that "observations, carried out on a large scale, prove that under such conditions as prevail on the wharf at Townsville, the heat does not affect in a constant manner the men working either in the holds of ships or on the wharf in the sun, as far as pulse-rate and blood-pressure are concerned, but only causes a slight rise in rectal temperature which roughly varies with the levels of the wet bulb reading."

From inquiries among the shipping companies he finds that in the height of summer the men's efficiency is lowered by 11 per cent.

Eijkman, in Java, carried out a large number of experiments in metabolism and came to the conclusion that changes in heat production due to the tropical climate were of no importance.

It is well known that the complexion is paler in the tropics than in the temperate zones, and it was thought to be caused by some special tropical anæmia. It is however more probably due to pigmentation of the skin as numerous blood counts have shown that there is no anæmia—if disease be excluded. Breinl and Priestley found there was no striking difference in red cells or colour index of the blood of school children in Northern Queensland. There was a slight relative decrease in polymorphs.

The Arneth index, according to these observers, showed a distinct shift to the left; but the significance of this is uncertain. Sweet, however, could find no difference between the Arneth index of school children in North Queensland and Victoria, both giving a higher figure than that usually taken as normal in Europe.

Whether the prolonged exposure to sunlight will eventually have any deteriorating effect on the race time alone will show. Woodruff considers the white races, more especially the blonde, to be quite unsuitable for living in the tropics, because of the deleterious effect of the sun. Aron and Gibbs, in the Philippines, showed that monkeys exposed to the direct rays of the sun died quickly if the atmosphere was quite still, but survived if a breeze was blown upon them, or if they were protected by the interposition of a pane of glass. By starting with small exposures and gradually increasing the length of time, animals became acclimatized to the sun.

In summer the glare is trying; mirage is extremely common in the interior. During the hot weather the temperature equilibrium is less well balanced, rising more easily and remaining higher for a longer period. This results in increased combustion and a loss of body weight. It is however of slight account: even in summer one feels the better for a moderate amount of exercise such as tennis or golf.

During the winter football is extensively played throughout North Queensland.

There is a considerable abuse of alcohol in the

tropics. It is quite understandable, partly because of the thirst caused by the heat, but largely because of the poor facilities for amusement. Before the misuse of alcohol can be rectified some alternative in the shape of games or other healthy pastimes must be provided.

But after all the ultimate test of a suitable climate is whether it is fit for the permanent residence of women and children without mental or physical deterioration.

EFFECT OF CLIMATE ON WOMEN.

The effect of climate on women was the subject of a questionnaire to medical men practising in the north, and the general answer shows that fertility is not affected, while the complications of child-birth are not more prevalent. Freda Bage made a careful examination of Queensland women students in Brisbane. She failed to reveal any difference between girls from North or South Queensland, either in physical condition or mental reactions. Mental tests, however, to be of value, must be carried out in actual tropical surroundings. During the northern summer personal experience shows that mental concentration is more difficult than in the cold weather.

As regards children, on the coast they are not so lively during the summer as in the cold weather, but this apparent lack of energy may be as much due to the discomfort of play in a humid atmosphere as to any actual physical feeling of ill-being. In the interior the children run about and play during the height of the day even in summer. But it is on the women that the real stress falls and many women undoubtedly show the effect of continuous residence in the north by irritability or slight neurasthenia. But whether the climate or the environment is to blame is a moot point. Help of any kind is extremely difficult to get, outside the larger towns. The result is that the married woman has to look after her house and children and do the cooking as well. The houses are badly planned, and have corrugated iron roofs, so that the heat inside becomes most trying. Owing to her domestic duties she cannot get out sufficiently into the open air; moreover there is a lack of ordinary comforts or social pleasures. Outside one or two large centres ice is non-existent and dependence on cooling is placed on canvas water bags hung up in the shade. Meat goes wrong very quickly, so has to be eaten as soon as killed. Away from the coast fresh fruit is difficult to obtain and any food left unprotected is infested with ants. In many places the supply of water for washing purposes is not unlimited. These conditions are by no means confined to the tropical portions of Australia. It is small wonder that some women became dissatisfied and neurasthenic and prefer to live in a cooler climate in the south.

The climate cannot, however, be held entirely to blame. It does not prove that the north is unsuitable for settlement, but that settlement to be a success must proceed upon lines which recognize these disabilities and try to correct them. Houses more suitable for hot climates should be built. They are

already raised off the ground on piles to avoid the depredations of white ants, and this allows the breeze to pass below the house. Wide verandahs are an absolute necessity. They should surround the house and be made suitable for sleeping out, with width of at least 12 ft. Roofs should be double, with a free air space between. Corrugated iron is the only cheap material available; possibly mud houses like the adobe dwellings of Mexico might be a solution.

Clothing should be light and loose fitting. White suits for men and women are no doubt the ideal, but are not practicable owing to washing difficulties. Thin khaki drill or tussore is a good and inexpensive material. Warm clothing is needed during the winter.

As regards domestic servants, it is impossible to get white help away from the large towns, and under present conditions the only way to assist the housewife would be to introuse labour-saving devices. The aborigines do not take kindly to domesticity. The men are useful for outdoor work, but as a rule the girls are unsatisfactory in the house, and are liable to return to the bush without any notice — some northerly stations do however employ them.

CONCLUSIONS.

Osborne, Professor of Physiology in Melbourne University, has stated that from the physiological standpoint the case against the tropics has not been proved.

Breidl gives as his opinion that eleven years of inquiry have failed to show any qualitative physiological changes among white people in tropical Australia.

With our present knowledge, therefore, there would appear no scientific reasons why white people should not successfully inhabit the north. These conclusions, however, must be accepted with caution, and will have to bear the test of time. Three or four generations of whites, born, bred and intermarried in the tropics, must elapse before the problem can be considered as solved. Meanwhile every effort should be made to carry out under good conditions this vast physiological experiment.

Under present circumstances, whether the north will become closely settled by whites is quite another matter. The north, taken as a whole, appears more suitable for sheep and cattle grazing than for close settlement. Griffith Taylor, after a careful comparison of meteorological conditions, says that the northern lands are not well suited for close white settlement. This is chiefly because of the lack of surface water, and of the monsoonal character of the rains, which cause a prolonged dry spell during the winter. There are, however, several rivers in the Gulf country, such as the Roper, which flow throughout the year.

No doubt, under present conditions, Taylor's conclusions are, just, but with our knowledge of what modern irrigation has done, there is no reason why — apart from economic questions — large areas should not be made available for fruit and cotton growing.

Some observers seem to imagine that coloured races

can be permitted to enter the north and remain confined there. This is contrary to common sense, and the ultimate and logical termination to the admittance of coloured races would be the eventual formation of a mixed Australian people.

Any sacrifice is worth making which keeps Australia white.

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LEPTOSPIRA ICTEROHÆMORRHAGIÆ IN THE WILD RATS OF WARSAW.

By LUDWIG ANIGSTEIN, M.D., Ph.D.

From the State Epidemiological Institute, Warsaw (Director Dr. L. Rajchman).

SHORTLY after the discovery of the causative micro-organism of the Weil disease in man, investigations were started on animals as carriers of *Leptospira icterohæmorrhagiæ*. In 1915 Miyajima, in Japan, confirmed the presence of spirochætes in the kidneys of a field mouse. These owing to their morphological, serological and pathogenic properties have been identified with *L. icterohæmorrhagiæ*. In connection with these findings other Japanese authors (Ido, Hoki, Wani, Ito, 1916), discovered the same organism in a great number (30 per cent.) of wild rats in Japan. Since many authors in different countries investigated the carriage of the Weil spirochætes by rats, Martin and Pettit, Stokes, Ryle and Tytler (1917) discovered *L. icterohæmorrhagiæ* in wild rats in France, Nicolle and Lebaillay (1917) found them in 28 per cent. of examined rats in Tunis, Coles in England in 9 per cent. of rats, Noguchi in New York in 8 per cent., Uhlenhuth and Zuelzer (1919) in 10 per cent. of examined wild rats in Berlin.

In Poland these investigations have not yet been carried out. The results of my present studies are based on examination of forty-two wild rats captured in the slaughter-house of Warsaw during September, 1922. Further researches will be extended upon

rats from other parts of the town. Independently of the results of microscopical examination a sterile emulsion of kidneys of several rats (four to six) was injected into guinea-pigs. In the emulsion of kidneys of one of the first rats I discovered spirochætes, closely resembling the genus *Leptospira* (Noguchi), under dark-field illumination and in stained preparations. The observation by means of the ultra-microscope makes obvious the characteristic features of the micro-organism so different from the type *Treponema* or *Spirochæta*. The ends of the very delicate filament (10 to 15 microns long) are curved in form of hooks, and have polar granules.

The emulsion of kidneys and liver of the infected rat was injected into guinea-pigs, these have now developed typical symptoms of infectious jaundice, and leptospiras could not be found. It was also not possible to transmit the virus by passages to other guinea-pigs.

The further examinations of ten rats were negative, but the injection of an emulsion of livers and kidneys, mixed, from four rats into guinea-pigs produced in them a rise of temperature to 41° C. after five to eight days incubation. During the illness it was possible to find every day living leptospiras in their peritoneal fluid.

It may be noted that by ultramicroscopical examination of the organs of the four rats mentioned no leptospira could be found in any of them. All three guinea-pigs succumbed to the infection after two to five days of illness.

The pathological lesions in guinea-pigs were severe and typical in every respect of infectious jaundice, namely, yellow colour of sclera, also skin round the mouth and anus, the subcutaneous tissue is intensely jaundiced and closely covered by ecchymoses, especially marked in axillary and inguinal regions. The peritoneum is hyperemic, often presenting hæmorrhagic spots. The peritoneal fluid is icteric. The yellowish-brown liver is in a great number of cases slightly enlarged. The spleen is not always enlarged. The intestine is yellow and injected. The most frequent changes were observed in the kidneys; they are swollen, hyperemic and presented minute hæmorrhages on the surface and in the parenchyma. Granular lesions were found in the suprarenal glands. In every fatal case hæmorrhagic areas in the lungs were noted. By the ultramicroscopical examination the presence of leptospira was confirmed. By inoculation of blood taken from the heart of icteric guinea-pigs into healthy animals the virus was cultivated *in vivo*. The second passage killed guinea-pigs in the third day of disease after two days of incubation. The pathological picture at the autopsy was typical in all passages. The next strain of leptospira was obtainable from the rat No. 21, whose kidneys inoculated into guinea-pigs also produced in them symptoms and pathological lesions characteristic of infectious jaundice, but only in the third passage. In the first two generations no leptospiras could be found in the ascitic fluid and blood of the animals, which were not icteric.

The rat No. 27 contained in his urine a very large quantity of leptospiras. Two guinea-pigs inoculated with 0.25 c.c. of the urine succumbed after two to three days of illness with presence of leptospiras in their peritoneal fluid. The pathological changes in the animals were typical for infectious jaundice. Leptospiras were detected in all the organs examined.

The obtaining of cultures of *L. icterohæmorrhagie* *in vitro* succeeded in inactivated horse serum diluted with Ringer's solution (1 in 3) and covered with a layer of sterile paraffin oil. The presence of leptospiras could be detected at the bottom of tubes by dark-field illumination after five days incubation at 37° C.

SUMMARY.

The principal points in my experiments are the following:—

(1) Four of the forty-two examined wild rats (10 per cent.) caught in the slaughter-house of Warsaw were found to be infected with a micro-organism belonging to genus *Leptospira* (Noguchi).

(2) Two strains of this micro-organism possessed a very high virulence for guinea-pigs.

(3) The lesions in guinea-pigs, inoculated with these leptospiras correspond in every point with the pathological picture of Weil disease, and brings us to the conclusion that the isolated leptospira is identical with *L. icterohæmorrhagie*.

Treatment of Furunculosis in Infants (C. G. Grulee, M.D., and C. B. Rose, M.D., *Journal of the American Medical Association*, vol. lxxvii, No. 2, 1921).—There are several points to be remembered in the treatment of furunculosis by roentgen-rays; one is that the lesions frequently vary in intensity without apparent cause. The general impression as to the results of the roentgen-ray treatment in these cases has been, on the whole, favourable; the results have shown that it is better to use a soft ray and no filter. These lesions are very superficial, and therefore easily reached, and hard filtered rays have produced epilation, even with short exposures, and may therefore be regarded as too dangerous to recommend in the treatment of superficial skin lesions in children.

The Treatment of Demodex Mange in the Dog (E. Aruch, *La Clinica Vet. Milan*, July 1, 1922).—The disease occurs in many parts of Italy. The author recommends the following method as giving excellent results. The coat must be brushed and thoroughly washed daily with tepid water, soap and creolin. The dried coat must be rubbed with cotton wool soaked in ether, and this must be followed by a second rubbing with ether containing 1-2 per cent. of iodine. Thymol, 0.25 per cent., or salicylic acid, 1 per cent., may be substituted for the iodine, but the latter is preferable. If the entire body is affected, it should be divided into three, four, or even five areas for consecutive treatment, so as to minimize the chilling action of the ether.

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WHITE SETTLEMENT IN TROPICAL AUSTRALIA.

ONE is apt to forget that part of Australia is in the tropics at all. That is, of course, culpable ignorance; yet most of us remember the day that the fact was brought home to us—aye, some time after our early student days.

In the article published in this number Dr. Cheyne brings it home in an excellently-told story, which sets us thinking on a subject which is bound to have far-reaching results.

What brought Australia to the pass it finds itself? Why did this Continent repulse both man and animals? Did the human race ever occupy Australia in larger numbers than we have known it in our histories? There were many islands of large dimensions close to its shores where the populations were quite dense—Java, Sumatra, Borneo, not to mention the multitudes of the islands of the Indian Archipelago, were but a short sail away. Yet beyond the Australian native "black boys" none of the neighbouring peoples sought to settle on the Continent. That they visited the Australian shores would seem most probable, but we are ignorant of the cause for the repugnance they must have evidently had to settle upon it. Four-footed animals and even the birds avoided Australia, and it is most probable that the cause of this will one day be discovered. Plant life again, seeing that so large an area is tropical, is insignificant and unlike that met with in other parts of the world.

Of human beings even the Malay, great traveller as he is and was, forbore to colonize the empty Continent. The Chinaman, the Japanese, and all races avoided Australia, and until the white men were compelled to go there all mankind turned their backs on it. We have no other part of the earth with a similar history; neither wild man nor wild animals stood in the way of emigration; on the southern maritime fringe land lay ready to cultivate, and in climate which was attractive compared with many others. No one has attempted to solve the riddle of why Australia was neglected as a suitable habitation for man or for animals; and not until white men were compelled to go there did human beings, except of the most primitive type, reside there. Their racial origin is lumped along with negroid neighbours, but the specialization is not agreed upon. It is useless to indulge in speculation about Australia, its fauna, or its appearance on the globe. We have neither data to go upon, nor excavations or tombs to hand to explain matters, and we have to study it first hand as it were. I can hear Australians denouncing all this as the vagaries of an ignorant man. I am content to have this slur thrown at me, if only it can bring light upon a dark spot in the history of mankind, and a peculiar fauna. Is there anything against populating Australia? Ask an Australian, and you will strike one of the most enthusiastic of men. Britain and British folk are the standard they take, and they claim superiority in every detail—of climate, of men and of beast. One listens, but although now and again inclined to say a few words of mild expostulation one is seldom induced to do so. British folk are so accustomed to hear themselves and their country held up to ridicule by not only foreigners but by their own blood relations in every other English-speaking colony, &c., and by even the

Celtic fringes in the British Isles, that it has come to be a sign of good breeding amongst the home dwellers to take it all in good part and to put up with it. Britain is no place to live in, the climate is fit only for a Britisher, whilst their own is the chosen spot for God's people on earth. An enthusiastic Australian or American, for instance, in the matter of the physique of their people, points to a superiority which is superlative. We have it cast up to us that we cannot grow either man, beast, or crops to perfection without more sunshine than we have in Britain, which is a slur on what passes for a climate amongst us.

Yet our prowess in the field, as in sport, has in the first instance always to be tested against men whose limbs have been cast in England and the mettle of their pastures proven. The climate is freely abused by the British themselves, yet we hear the late American—Passmore Edwards stating that for fifty years he has travelled widely, living for a time in every country with an approximation to a settled government, and yet in his old age he has made up his mind to settle in the south-eastern district of England because "it is never too hot to do what you want to do and never too cold to do what you want to do, and you cannot say that about any other country or climate in the world."

British soil gives crops, according to the Americans who know, thrice the returns that theirs do, &c. It is useless and quite un-English to boast, and so they listen with "good breeding," and regarding it with the restraint of the Keiths in Scotland in former days as they whisper: "They say! What say they? Let them say."

Prowess in sport is a continual boast. In regard to this point the writer, when writing his book on "Physical Efficiency," endeavoured to ascertain the origin of the Australian cricketers who visited this country in 1905. The information was supplied by Dr. Drummond Morier, himself a dweller in Australia for several years, from figures supplied by that distinguished cricketer, Mr. Frank Laver. The entry in the book, "Physical Efficiency" (Putnam's Sons, London and New York, 1906), was as follows:—

"The 1905 Australian Cricket Team.

"The parentage of the men composing the Australian Cricket Team that visited Britain in 1905. All the members of the team were born in Australia. Of the members of the team:—

4	had father born in Australia;	mother born in Australia
3	" " " Australia;	" " " England
3	" " " Australia;	" " " Scotland
1	" " " Australia;	" " " Ireland
1	" " " England;	" " " Australia
2	" " " England;	" " " Scotland
1	" " " Denmark;	" " " Scotland"

Comment is needless.

The population of Australia does not grow as might be expected; it hangs fire in some way. Is it the trying climate? Not according to the inhabitant. No inhabitant of any country—cold,

temperate, or tropic, except the British—ever say or will hear a word said against their climate. Is it a high mortality? As far as we can gather it is not. Is it the want of work amongst women of the labouring class? Largely so. When a girl goes from British shores to Australia she hopes for and expects a step up in the social grade and to be able to keep a servant, she herself it may be having come from that employment. In this there is a real difficulty. Is it a low birth-rate or limited families? Both. The all-conquering Briton conquered because of the size of the families and the absence of disease through greater perfection of sanitation lessening the death-rate. No race of people allow that their locality is unhealthy or is subject to disease. Practically no resident in the tropics will allow that *their* place is malarial, and few that they themselves have had malaria. The Singaporeans will declare that they have not malaria, but that it is in Penang and the Straits they have malaria, or in Hong-Kong, Canton, Shanghai. In their turn each of these places will ascribe the disease to Singapore or to any other place but theirs. A babyish fetish, a lie on the face of it. So the Australians will acclaim their climate the healthiest in the world, their climate perfection; and when tackled about a drought for three years and three million sheep dead, pass it over with a "That's nothing," in twelve months these are stocked again.

In no country in the world have we white people doing "labour" in the tropics except one, the "poor whites" in the East India islands, and they are not a favourable example of the energy, intelligence, or staying power of the progeny. The Jewish race is the exception. Although a white race they have been Oriental for thousands of years, and their energy and intelligence are superb. To take them as an example of a white race bodes well for a white Australia after many centuries perhaps, but meantime the development of the country will be slow and the chances of success in the experiment a question.

One does not venture to damp the ardour of the White Australia upholders; one does not wish to do so. So far other is the hope, and we who view the matter from a distance hope that our doubts are not likely to be dashed aside but that the young Continent will be fruitful, and, in spite of gloomy forebodings, we will see success and that a healthy home may be provided for British folk. The present inhabitants are in their physique a good type of mankind, and thus the progeny of the second, third and fourth generation may continue to thrive as they have begun.

Another question, and a vital one, is the propriety of tilling the soil—primeval it may be called—of Australia by fresh imports from Britain. They are asked to labour under a tropical sky whilst unacclimatized and unused to the environment. Will not the sudden change exhaust them to the deterioration of their progeny? Could not acclimatization

be insisted on and oriental labour be utilized meantime? We want to see something better than bush life or mining, and that instead of the bush in the great plains agriculture may thrive, for in the country, not in the towns of Australia, are we likely to raise a people of the highest type. It must be remembered that south of the equator the Tropics is a very different matter compared with the lands to the north. The lands to the north of the equator are crowded with a people long native to the soil, with ailments of a deteriorating type which has long prevailed, and a type of people produced who are without the energy and stamina of northern folk. Is this an assumption merely? Some of the native races in the more northerly areas, such as Sikhs, are a fine type. The Chinese, although largely a northern people, have a fringe in the south of many tens of millions which are energetic, alert, excellent labourers and apt brains. So that the fresh land available in Australia, uncontaminated with diseases of the soil, offers attractions and possibilities which are as yet untested, which by analogy may give a future to Tropical Australia which may meet a flourishing state of things of great importance to the food, &c., of the world.

Some notable points in Dr. Cheyne's paper are: "Little is known of the geography or climate of the N.W. Kimberleys and Arnhem Land."

"There are three good-sized plateaus in Northern Australia over 2,000 ft.; Atherton, which is now being closely settled chiefly by ex-service men, and dairying and mixed farming are successfully carried out."

The Atherton plateau is the wettest region in Australia, where the average fall is 165·6 in. yearly.

"The McDonnell Ranges in Central Australia and the Fortescue river area near the West Coast. Neither of these is at present settled."

Heat-stroke or sun-stroke is extremely rare in Northern Australia—so rare, in fact, that Professor W. A. Osborne, University of Melbourne, maintains "there is some other factor in the production of heat-strokes besides the sun," and he considers malaria or some infection to be constantly present. It must be remembered that heat- and sun-stroke are more common in subtropical than in tropical countries. These conditions are as common in the city of New York, U.S.A., as in any other part of the world.

"Malaria is of but little significance in Australia, but in certain parts of the Kimberleys malaria is endemic."

"*Nyssorhynchus annulipes* is common in Australia, but that it is a potent agent in spreading the disease is not proven."

"The two widespread diseases which occur in the tropical belt are ankylostomiasis and filariasis. Both *A. duodenale* and *Necator americanus* are found. The seriousness of hookworm infection lies especially in the mental and physical stunting of children."

"Yaws, sprue, ulcerative granuloma and beriberi occur, but are in no sense widespread."

"Plague has never reached an epidemic form."

"*Stegomyia fasciata* is perhaps the commonest mosquito in Australia." Yet this mosquito, although present, has never been guilty of introducing yellow fever.

"Barcoorot, a form of veldt sore so common in S. Africa, is met with in the dry belt of Australia."

"Billyandu spew is a peculiar condition in which during a meal a man is suddenly seized with an attack of vomiting, after which he is able to continue his meal . . . Swallowing flies is held responsible for the ailment."

"The reasons for the sparse population of Australia is partly owing to climatic conditions but largely economic."

"The question of the housing, domestic help and the hard work in the rural populations is a heavy tax on women, and has much to do with the scarcity of the population in Australia."

J. CANTLIE.

Annotations.

The Active Principle of Korean Ginseng (I. Saito and K. Abe, *Japan Medical World*, vol. ii, No. 6, June, 1922).—The substance in ginseng which has inhibitory action on blood sugar is not extracted by petroleum ether or ether, but by pure alcohol.

The active principle of ginseng is a glucoside.

Seasonal Hay Fever (J. H. Black and Annette Black, *Journal of the American Medical Association*, vol. lxxix, No. 26, December, 1922).—Autumnal hay fever is quite common in northern Texas, while vernal cases are rare. In autumnal cases studied the patients, without exception, have reacted to rag-weed. No case due to grass pollens (except corn) has been seen.

Onset and duration of autumnal attacks correspond to pollination time of rag-weed, extending from about August 20 to October 10. Sixty per cent. of all cases seen showed multiple sensitization: 49 per cent. were sensitive only to members of the same botanical group.

No patients were treated with combined pollens. When multiple sensitization was found in autumnal cases, rag-weed pollen was used. The intradermal method of testing proved more dependable than the scratch method. Best results were obtained from treatment when doses were given at a four-day interval. Treatment should not be discontinued before the beginning of the season. Better results probably follow when treatment is continued during the season. Patients given 1:100 pollen obtained somewhat better results than those stopping with smaller dosage.

Reactions, local or general, are infrequent if the dosage is carefully graduated. Seasonal treatment alone was not used. In 65.8 per cent. of all autumnal cases, there was more than 50 per cent. improvement, and in 15.2 per cent. more than 75 per cent. relief from symptoms was claimed. No complete cure was obtained.

Reports of Societies.

At a meeting of the Section of Tropical Diseases and Parasitology of the Royal Society of Medicine held at the Society's house, 1, Wimpole Street, London, on Monday, February 5, 1923, at 8.30 p.m., Sir Leonard Rogers (President) in the chair, a paper was read by Dr. Arthur Powell on "Yaws: (a) The History of its Introduction into India; (b) Personal Observations on the Primary Lesion always Extra-genetic and Identical in its Clinical Aspect to the Nodules of the Secondary Eruption in 205 Cases."

A discussion followed, in which Dr. Castellani, Dr. Collingwood, Dr. Graham Forbes and Dr. Hugh Stannus took part.

This paper was of particular interest and importance, and should be widely read amongst medical men in tropical countries, where yaws is found.

It is not often that the introduction of a disease has been described with the accuracy Dr. Powell shows; the questions of the "primary sore" and "tertiary lesions" of yaws were discussed in the paper and debated afterwards.

THE ROYAL SOCIETY OF TROPICAL MEDICINE.

A PAPER on "The Treatment of Trypanosomiasis by 'Bayer 205'" was read by Dr. George Low and Dr. Philip Manson-Bahr before the Royal Society of Tropical Medicine on January 18, 1923. "Bayer 205" is a light, purely divided powder readily soluble in distilled water. It is probably an aniline compound and contains no metallic ingredients. A very considerable amount of experimental work has been carried out on this drug in Germany, from which it appears that it is a very powerful trypanosomicide to laboratory animals for *Trypanosoma gambiense*, *rhodesiense*, *miceli*, *equiperdum*, *equinum* and *congolense*, but apparently has no action upon *T. vivax* or *T. capræ*. From experiments performed on mice in this country Wenyon has stated that the ratio of the minimal therapeutic dose to the maximum tolerated dose is as 1 in 60. So far few cases have been reported of the successful treatment of trypanosomiasis in man by means of the drug. The patient reported by Muhlens and Merik was a *rhodesiense* case who recovered eating after 2.5 gm. had been injected intravenously in a series of three injections. The authors of the paper decided that a dose of 1 gm. was to be considered a therapeutic dose for man, and that a series of ten injections, totalling 10 gm. altogether, should be considered a curative course.

Altogether they treated nine cases, with complete success in seven. Two cases—one a *gambiense* case in the terminal "sleeping sickness" stage, and one a *rhodesiense* case, who died in spite of massive doses of the drug—one after 18 gm., the other after 29 gm. Some of the successful cases were most striking, one, in particular, who had already been under treatment for over one and a half years, during which time the trypanosomes had resisted every known form of

treatment. Injection of large doses of antimony tartrate had no effect. The trypanosomes, which were very numerous in the blood at the time of the first injection, disappeared entirely from the peripheral blood and have not been seen again (that is over one year ago).

The total amount given to these apparently cured cases was 10 gm. In two cases trypanosomes reappeared temporarily in the blood-stream; in one instance after 5 and in the other after 3 gm.

It therefore follows that a full course of treatment is necessary in every case.

In order to be completely effective it is estimated that a dose should be given once a week.

The administration of the drug is given in almost every instance by an albuminuria with granular casts. This albuminuria persists for several weeks after the cessation of treatment, but is not permanent. A Fehling-reducing body is also produced sometimes. The improvement, both physical and mental, in all the cases, five of whom were present at the meeting, was remarkable.

"The World Incidence of Leprosy in Relation to Meteorological Conditions and its Bearing on the Probable Mode of Transmission," was read before the Society on February 15, 1923, by Sir Leonard Rogers, M.D., F.R.C.P., F.R.S.

The amount of leprosy in different countries varies very greatly. Maps were shown illustrating the annual rainfall and temperature isotherms and compared with those in which the incidence of leprosy per mille had been carefully and laboriously plotted out. Areas with the highest leprosy incidence, 95 to 200 per mille, are situated in tropical regions with the highest rainfall rates: South America, French Guiana (11), Dutch Guiana (25), a large belt of tropical Africa, including French Guinea (5), French Ivory Coast (60.7), North Nigeria (5.2), the Kamerouns (20), French Equatorial Africa (13), Abyssinia (20), and a 150-miles strip on the eastern border of the Belgian Congo (200)—the highest rate in the world—and the wet eastern end of Madagascar; while in Oceania there are New Caledonia (26), Loyalty Islands (36), Marquesas Islands (66.7), and Hawaii (11.8). All these high rates are only found in hot, humid climates.

Tropical areas with high leprosy rates of 1 to under 5 per mille include Cuba (13), Jamaica (2), Trinidad (1.6), Columbia (3), British Guiana (4).

The leprosy incidence in very dry tropical areas is very low. Thus Peru, Western Bolivia, North Chile, South America, and German South-West Africa, are the only important tropical areas reported free from leprosy. These are the only ones with very hot dry climates.

The incidence of leprosy in temperate zones, in very marked contrast to the high leprosy rate in the tropics, is its slight incidence in higher latitudes than 40°, comprising the temperate zones. This striking distribution and its relation to atmospheric conditions is most strikingly brought out in a

detailed study of the incidence of leprosy in India. The conclusion arrived at from a consideration of collected facts is that the world incidence of leprosy indicates much more frequent infection in humid hot than in dry hot tropical climates, in which any such condition as backward civilization and hygiene increase the frequency of exposure to infection.

Moist soft skins in hot climates are favourable to small abrasions and induces much scratching, thereby facilitating the entry of the leprosy bacillus. Intimate contact is of course a very important factor.

Medical News.

SEAMEN'S HOSPITAL SOCIETY'S TROPICAL DISEASES LIBRARY.

THE Tropical Diseases Library was formed in February, 1921, by an amalgamation of the Library of the London School of Tropical Medicine with the collection of bound periodicals belonging to the Tropical Diseases Bureau. These are deposited in the Library on permanent loan, but in the future the new volumes will be transferred as soon as they are bound. The Librarian, Mr. Cyril C. Barnard, took up his duties on February 15, 1921, and began the task of rearrangement. The bound periodicals from the Tropical Diseases Bureau, numbering 1,209 volumes and comprising sets of 139 different journals, were gradually transferred to the Library, and as many of the most important journals as there was accommodation for were arranged in the Reading Room and classified according to country of publication.

A MEDICAL Congress will be held at Angola from July 16 to 23, 1923, under the auspices of the Portuguese Government.

THE next Pan-Pacific Science Congress will be held in Australia in August, 1923, under the aegis of the Australian National Research Council. The meeting will be opened at Melbourne on August 13 and will terminate there on August 22, when members will leave for Sydney, where the meeting will open on August 23 and terminate on September 3, 1923.

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Original Communications.

THE ASSOCIATION OF CERTAIN COMMON COMPLAINTS AS SEEN IN NATIVE HOSPITAL PATIENTS WITH THE PRESENCE OF MICROFILARIAE IN THE BLOOD.

By B. J. COURTNEY, M.D.

Medical Officer, W.A.M.S.

I THINK that it will be generally acknowledged that microfilariæ are among the most common, if not the commonest parasite found in the blood of the Northern Nigerian native; it is also unquestionable that a considerable number of diseases may be produced by filarial infection, e.g., lymphangitis and enlarged glands amongst the lesser affections, and elephantiasis and acute abdominal disease amongst the greater. Assuming, then, that these two statements are correct, I have for a number of years remarked the extreme rarity of filariasis as set forth in the Annual Returns—the total number of out-patients stated to be affected being only thirty-six in a period covering seven Annual Returns, 1911-1918, excluding 1913—and I have wondered whether any of the more or less trivial ailments seen amongst patients, which one is apt to set down under the somewhat vague headings of "Myalgia," "Chronic Rheumatism," "Abscess," &c., would show any sort of constant relationship to filarial infection.

With this object in view I have examined the blood of a number of natives, the results of which are shown in the subjoined tables, indicating the proportion of filarial infections of any variety, the proportion of infections of known pathological significance, i.e., by *Filaria bancrofti* and *F. loa*, and lastly, the proportion of infections found in persons suspected for clinical reasons of harbouring these parasites. Beyond this I have added short descriptions of the clinical features of a few typical cases and discussed their differential diagnosis.

As regards the differential diagnosis of the microfilariæ from each other—the films were taken in the evening between 6 and 9 p.m.—the following day the hæmoglobin was removed with water, and they were then fixed and stained with either methylene blue or hæmatoxylin, usually the latter. On examination, *Microfilaria perstans* is easily distinguishable from *bancrofti* or *loa*, as it has no sheath and is appreciably smaller. Between *M. bancrofti* and *M. loa* comparative measurements of size, at any rate in my hands, were indeterminate and unsatisfactory, and I relied for diagnosis on the following two points, viz., that in *bancrofti* the coils are close, spiral and graceful, in *loa* the disposition is in wavy ungraceful lines; secondly, that with prolonged hæmatoxylin staining the tail nuclei in *bancrofti* do not extend to the end, whereas in *loa* they do. According to Fulløhm, the differentiation of these two points are sufficient to make a

correct diagnosis. The observations were made at Ilorin, Naraguta and Ankpa, but although the proportion of infections at these places showed some variation, as the films were taken mostly from soldiers, police, prisoners, patients and servants—that is to say, from persons not indigenous to the districts, I do not think any useful inference could be drawn from tabulating the results separately.

TABLE I.—Filarial infections, any variety.

Number of soldiers, prisoners, &c. examined between 6—10 p.m.	Number found with microfilariæ	Per cent.
172	73	42.4

TABLE II.—Infections of known Pathological Significance.

Number examined	Microfilaria bancrofti	Microfilaria loa
172	24 = 13.9 %	8 = 4.6 %

TABLE III.

Number examined who for clinical reasons past or present suspected of infection by either bancrofti or loa	Microfilaria bancrofti	Microfilaria loa	Number of parasites or perstans only
45	16 = 35.5 %	6 = 13.3 %	23

It will be observed by Table III the very much greater percentage of microfilarial infestation found in persons suffering from common hospital complaints, such as lymphangitis, abscess, &c., and it appears to suggest that the morbidity produced by these parasites is larger than is usually attributed to them.

CLINICAL EXAMPLES OF DISEASES ASSOCIATED WITH FILARIAL INFECTION.

Case I: Lymphangitis and Varicose Glands.—A soldier admitted to hospital for rheumatism. On admission had complained of pain, stiffness and swelling at the back of the left knee, headache, backache and pains in the arms. Temperature, 100° F. When I saw him a few days later his temperature was 99° F. Complained of pain and stiffness of the left knee, and gave a history of swelling and pain of that leg twice previously. On examination there was moderate but distinct œdema of the leg below the knee, tenderness of the back of the knee, and soft doughy swelling of the femoral glands, and to a lesser extent of the inguinal glands, neither of which were tender. *M. bancrofti* were found both in the blood and in the gland juice taken from the femoral glands; prominent and tender lymphatic vessels could be felt, and in a good light seen at the back of the knee and extending up the thigh. With rest and fomentations the condition subsided and he returned to duty.

Case II.—A soldier—swelling, stiffness of left leg—attributes his symptoms to "Sanyi." Records show an entry for rheumatism some months before, which he says was in the same leg, and he was in hospital in Lokoja three years before also with "Sanyi" of the same leg; has not had syphilis or guinea worm. Examination shows slightly tender swelling of left leg, painless enlargement of femoral

¹ A native word, literally "cold."

and inguinal glands, and *Filaria bancrofti* in blood.

Case III.—A house-boy. Complained of back-ache, and was regarded as a case of lumbago, and treated with sodie salie, for three days without improvement. Examination on the fourth day showed a localized, tender hot swelling in the lumbar region, which was explored with a needle, but no pus was obtained. Temperature was 100° F. Blood examination negative. Swelling subsided about sixth day.

Some months later this patient had similar but less painful and smaller swellings on two occasions of the arms, and *M. loa* was found several times in the blood.

Comment on the three cases above: With regard to clinical diagnosis, there is no resemblance to acute rheumatism; by chronic rheumatism I understand is meant myalgia or fibrositis, a condition more or less corresponding to the native word "Sanyi" (literally cold); and from fibrositis, lymphatic lesions produced by filariæ, are distinguished by the history of recurrence in the same limb or part, by the more diffuse character of the tenderness and pain, by the very frequent presence of enlarged glands, which are soft, doughy and non-adherent to the skin, and by the tenderness of the lymphatic vessels, which in a well-marked case can be seen and felt. The lesions "Calabar swellings" attributed to *F. loa*, of which I have given an example in Case III, are distinguished from fibrositis by the more defined and localized swelling, their fugitive nature, and comparative rarity.

I have rather emphasized the distinction between rheumatism and filarial disease, because it seems possible that many of the slighter and less marked cases of filarial lymphangitis and Calabar swellings are liable to be called rheumatism. The patient is likely to be misleading by talking about "Sanyi," the inflamed lymphatics are not easily seen as in a white man, the swelling is often not pronounced, and enlarged glands perhaps not looked for.

The differences between guinea worm, gonorrheal rheumatism, various syphilitic lesions, &c., all of which the native not infrequently also calls "Sanyi," and lymphangitis there is no need to describe. I have notes on several cases similar to No. 1, II and III.

Cases IV and V.—Soldiers admitted to hospital complaining of swelling and slight pain, in one case in the thigh, the other in the calf of the leg. The temperatures were between 99° F. in the morning and 101° F. in the evening. The swelling increased very greatly for five to seven days, but no pus pointed anywhere, and as the pain was not severe no active measure to locate the pus was taken until after seven days. As the swelling was not decreasing and no pus pointed, the limb was explored under an anæsthetic and a large deep-seated abscess found and emptied, in one case in the calf muscles, and in the other in the thigh muscles, the abscess cavity reaching to the bone in each case, and containing a very large quantity of thin, pale yellow, odourless pus.

M. bancrofti was found in the blood of both these patients.

Cases VI and VII.—Symptoms and physical signs as in IV and V, but the abscesses were situated deeply in the muscles of the back in the one case in the infra-spinatus muscle of the right scapula, and in the other in the back muscles below the scapula on the left side. *M. bancrofti* was found in the blood of both these patients.

Comment on Cases IV, V, VI and VII.—Filarial abscesses have clinically several quite distinctive features which serve to differentiate them from those which are due to the activity of pyogenic organisms.

(1) The temperature, the pain, and amount of malaise and constitutional disturbance are all much less than is usually associated with pyogenic abscess of equivalent size.

(2) The abscesses are always deeply seated in the substance of muscles, and so have no tendency to point, but extend in the line of least resistance in the muscles.

(3) They frequently attain a very large size, and in my experience are single (not multiple, as is usually stated), but not infrequently recurrent, the patients showing scars, and giving histories of previous abscesses in the same limb or region.

(4) When evacuated the pus is thin, pale yellow, odourless, perhaps sterile, and the abscess and its concomitant symptoms disappear much more rapidly than a like abscess due to pyogenic organisms.

In two other cases in which *M. bancrofti* were found in the blood there were fairly large deeply seated swellings, in one case in the thigh, in the other in the gluteal muscles, associated with slight temperature and malaise. These swellings disappeared without the formation of pus, and I regarded them as probably aborted filarial abscesses with serous infiltration only.

The abscesses described by various authors who have studied tropical myositis, and who attribute their causation to either staphylococcus infection or pasteurella, appear from a clinical point of view to differ considerably from the abscesses described above, the causation of which I suggest is filarial.

In the former (staphylococci or pasteurella) the illness produced is often acute, and death sometimes occurs; rigors and high fever appear to be common; the abscesses are generally multiple or occur in crops, and the pus when evacuated is described as having a chocolate colour resembling that from a liver abscess.

I have seen intramuscular abscesses containing thick, dark-coloured pus, with clinical symptoms corresponding to those referred to in the last paragraph, and it is interesting to record that with one exception (not included in the above series) no microfilaria were found in the blood.

Apart from the possibility of an abscess of filarial origin becoming infected secondarily with staphylococci or other organisms, in view of these differing clinical pictures, is it not possible that there may be more than one cause for tropical myositis?

Case VIII.—In this case the presence of adult filariæ in the lymphatic tissues of the abdomen are offered as a suggested explanation of the symptoms. The patient, a soldier, was in the absence of the medical officer admitted to hospital complaining of severe abdominal pain, vomiting and inability to pass urine or fæces for forty-eight hours. He was put in bed, given a dose of Epsom salts, and fomentations applied to the abdomen. Urine was passed during his first twenty-four hours in hospital, and the bowels acted within forty-eight hours, and the vomiting ceased, but the pain remained. I did not see him for three weeks after his admission to hospital. His temperature was then 100.5° F., he complained of abdominal pain, and an examination showed a swelling in the lower abdomen, reaching from the symphysis pubis to about half the distance between that point and the umbilicus, and having the appearance of a distended bladder; the muscles over the swelling were rigid and resistant, but scarcely board-like, and the area was very tender. A catheter was passed without difficulty, but only a couple of ounces of urine were drawn off, which left the swelling, abdominal pain and rigidity unaltered. A tentative diagnosis of appendicitis was made with an abscess formed or forming in the pelvis, all food by the mouth was stopped, the rectum was cleared by an enema, and 4 oz. of saline was given per rectum every two hours, to which small quantities of egg albumen and bovril were added after twenty-four hours, and in the absence of improvement it was decided to open the abdomen after forty-eight hours.

At the end of that period, however, the hypogastric swelling had much diminished and the general condition improved, but twenty-four hours later there was a relapse, the symptoms and signs being the same, except that they were less severe, and that the pain, rigidity and swelling were now in the left iliac region. The same treatment was adopted, and in a few days the patient became convalescent, and was discharged some two weeks later. Ten days after discharge he was readmitted with the same symptoms, rigor, vomiting, and severe abdominal pain, but now the abdominal swelling, rigidity and tenderness were in the epigastric region. This attack lasted four days, when the patient became convalescent, and has remained well since during a period of five months.

The points which appeared to me to negative the original diagnosis of appendicitis were:—

(a) The length of time which elapsed, three to four weeks between the onset of the disease, and the delay of either abscess formation or resolution of the inflammation.

(b) The rapid disappearance of the swelling when it began to decline.

(c) Its appearance in two different abdominal sites, accompanied by the pain, rigidity, tenderness and dullness on percussion.

The presence of *M. bancrofti* in this patient's blood suggested to me that a possible explanation

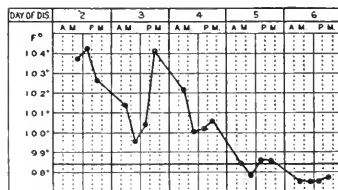
of his symptoms may have been a lymphangitis of the retro-peritoneal lymphatics, resulting in a local peritonitis, which changed its site as various lymphatic areas were involved.

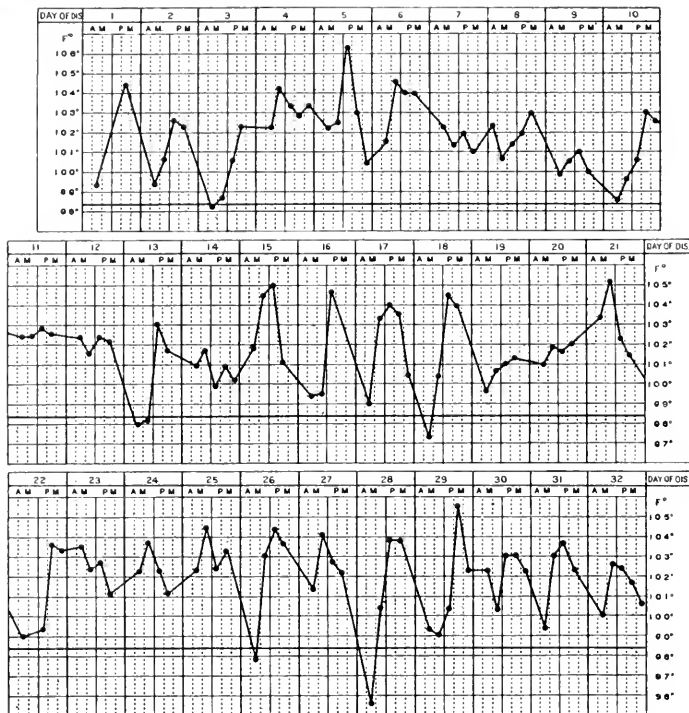
The remaining cases referred to in the table, in which pathological conditions were associated with microfilariae in the blood, were either similar to the seven examples referred to above or were obvious cases of filarial disease, such as lymph acrotum, and do not call for any special mention. They include, however, two of hydrocele, and I suggest that perhaps this very common affection amongst natives may more frequently than is supposed be the result of filarial infection.

A PRELIMINARY REPORT ON AN EPIDEMIC OCCURRING AMONG RECRUITS IN A TRAINING STATION IN SIAM.

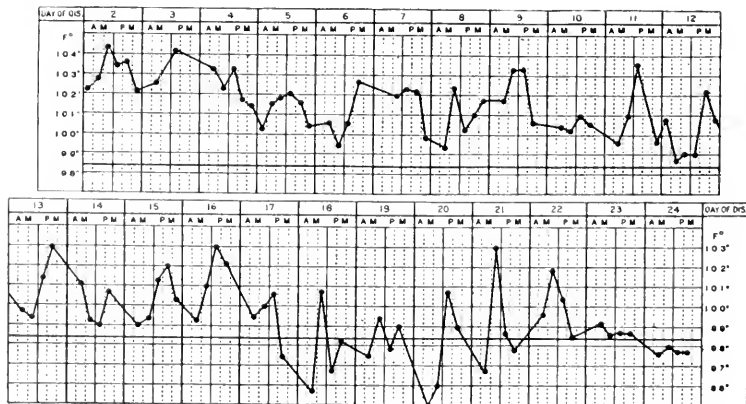
By MOM CHOW THAVARA, M.R.C.S., L.R.C.P.
Surgeon-General, Royal Siamese Navy.

This disease appeared among the men at one of the district recruit training stations containing about 650 men in all, including officers. The outbreak was in an epidemic form and occurred in two series of twenty-four and six cases respectively. The first case was admitted into the hospital on May 16, and the last case of the first series on June 10.





Temperature remained above normal for further eighteen days. In this case there was very severe arthritis.



shot, but reacted well to light and accommodation. The heart was regular and rapid and the pulse firm, strong and of good tension. In the lungs nothing abnormal could be detected. Constipation was usually present, but in one or two cases there was diarrhoea, with ten to twelve stools a day, lasting till the second day; the tongue was furred, but the appetite remained good all through the illness, so much so that the patients asked for the ordinary full diet saying that the fluid diets could not appease their hunger. The urine was usually of high colour and specific gravity as seen in other fevers; no albumin was present. There was usually a rash present on admission which faded on pressure and was to be seen on the arms and legs, especially over the joints of wrists, ankles and knuckles. Liver and spleen were not enlarged.

The course of the disease varied with the severity. In the milder cases the temperature fell to normal between the fourth and seventh days, the headache disappeared and the pain in the joints gradually lessened, leaving a little stiffness which lasted a few days longer. In the severe cases the headache and pain in the joints gradually increased till about the fourth or fifth day; the temperature gradually rose and attained its maximum on third to fifth day. It rose as high as 106° F. in one case, but the usually maximum temperature was 105° F. The heart became feebler in action, but still very rapid, from the third or fourth day onwards. About the second day the patients usually complained of difficulty in passing urine, and in some cases there was complete retention, which condition persisted several days and in one case over three weeks. The rash which appeared on the first or second day gradually changed its character, in some parts disappearing, while in others the eruption increased in size to 5 mm. or more in diameter, assumed a darker hue, becoming eventually almost black and no longer faded on pressure. After about the eighth or ninth day in some cases desquamation took place, while in others the eruption became vesicular and pustular. The distribution of the rash was very peculiar, being abundant on the arms and legs, especially on the knuckles, wrists, ankles, palms, soles, and joints of the fingers. In only one case was any rash seen on the chest and none was ever seen on the abdomen. One or two spots were usually seen on the forehead. About the same time all the joints became very painful and swollen, but not red. The intensity of the swelling seemed to vary with the amount of rash over that particular joint. The inflammation seemed to be entirely periarticular, no excess of fluid in the joints themselves could be detected. Though repeated punctures were made, neither blood nor serum could be obtained. In several cases there was also rigidity of the spine, but no Kernig's sign was present. This rigidity was probably due to arthritis involving the vertebral joints, as there were no other signs of meningitis. The temperature was of the remittent type throughout changing to remittent before becoming normal, and lasted over a very variable period from two to five weeks or more. There was a very

marked mental disturbance. After the first violent maniacal outburst, lasting for two or three days, had subsided, the patients became very apathetic. They seemed to find it an effort to understand what was said and especially were prone to make wrong answers, and sometimes to use wrong words. In two cases there was partial loss of memory. By the end of the first week there was a marked change in the general condition, the skin which was at first hot and dry became constantly moist. The patients became so emaciated and feeble that they could hardly turn over without assistance. Sleep from the very beginning was almost impossible except under the influence of morphia.

Examination of the blood of patients in the first series showed that during the first three days there was a slight leucopenia. After the fourth day there was a polymorphonuclear leucocytosis. Nothing else was found on microscopical examination. Further examination was undertaken by Dr. Robert of the Pasteur Institute. Blood from four different patients was taken during the second, third, fifth, and seventh day of disease. Broth and agar cultures were sterile after fourteen days' incubation. Four guinea-pigs were also injected with the same blood. Three died during the third week after injection, but at post-mortem nothing was found to be abnormal, except a slight increase of the peritoneal fluid which was found to be sterile. All abdominal organs were found normal.

The contents of the pustules were also examined, nothing but pus cells were seen and culture proved also to be sterile. Neither quinine nor salicylates seemed to have any influence. Even when the temperature was brought down by cold sponging and antipyretics the pain in the joints and headache still remained very intense. Relief and sleep were only obtained by the use of morphia in $\frac{1}{2}$ and $\frac{3}{4}$ gr. doses.

Many of the men in the station were found to be infested with head-lice, though none of the patients had any. All contacts were disinfected and their clothes, bedding and rooms were disinfected on May 31. The last case appeared on June 10. This would seem to point to an incubation period of not exceeding fourteen days.

In the above series of twenty-four cases three deaths took place on the third day from sudden heart failure, and a fourth death from exhaustion after twelve weeks' illness.

A second series of six cases developed on August 15, with one death on the second day, also from sudden heart failure. This case had purpuric eruptions on the limbs. Unfortunately no post-mortem could be obtained on any of the cases.

Blood from another case of this second series was taken and sent to the Medical Officer of Health for Bangkok for examination, who reported the presence of a bacillus, in pure culture, having all the appearances of the *Bacillus pestis*.

The case from which this blood was taken was a comparatively mild one. The maximum temperature was 104° F., which became normal on the fourth day and has since remained so; all symptoms disappeared

by the seventh day with the exception of the joint pains, which lasted till the tenth day. It seems hardly possible to have septicæmic plague with symptoms so mild as in this case.

The recovery in all cases terminating favourably was complete, though in the severe cases the temperature remained above normal six, seven, or even eight weeks after the onset. The severe arthritic cases remained in the hospital for many weeks longer before they could walk. Convalescence also occupied a very long period. No complications or sequelæ have been observed.

DIAGNOSIS.

The diagnosis has so far been left open. Though from a public health point of view the presence of such a bacillus makes it necessary that these cases should be regarded as those of plague, from the clinical point of view these cases differed in almost every respect from cases of septicæmic plague as seen here, especially in the low death-rate (only five deaths in thirty cases), and the comparative mildness of many of the symptoms. Another consideration against the diagnosis of plague is that there were no cases of plague in the neighbourhood and none have been reported for many years. Sixty-three rats were killed in the barracks and grounds. No evidence that rat-plague was present among them could be obtained; but one of the four rats caught in the market close by showed the presence of a plague-like bacillus in the spleen.

The first three or four cases were diagnosed by the medical officer in charge as dengue, but the severity of the symptoms made this diagnosis doubtful, especially the arthritis and the general appearance of the eruption. The fact that so few were attacked among 600 men living close together in barracks makes this diagnosis improbable. Added to this must be considered also the fact that there were no cases of ordinary dengue in the barracks or in the districts around.

Of other exanthemic fevers typhus has been suggested as a diagnosis, but the very early eruptions and the clinical course are against it. Apart from this, typhus has never been shown to occur in these parts.

Carbon Tetrachlorid in the Treatment of Hookworm Disease (S. M. Lambert, M.D., *Journal of the American Medical Association*, vol. lxxix., No. 25, December, 1922).—Carbon tetrachloride is a vermifuge and vermicide of great potency. It gives little discomfort to the patient. It permits of rapidly treating, at a low cost, vast populations suffering from hookworm disease.

Re-examination of the faeces of 823 treated patients indicated that one treatment administered to each individual in a given area had lowered the original infection rate of 100 per cent. to less than 9 per cent.

Clinically, the standard of health of the community is immediately raised.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 15, 1923.

QUERY REGARDING MUSHROOM POISONING WITHOUT REINFECTION BY THE FUN- GUS AFTER EIGHT MONTHS' INTERVAL.

IN a measure the following notes may be of some value in the huge question which has been brought before the world of medicine under the heading of

ensitization and Anaphylaxis. They are words which have cropped up within recent years, and they are not to be found in dictionaries of medicine of, say, twelve years ago or less. Like in *Atlases of the World*, publishers of dictionaries for use in medicine are not prone to let it be known the dates of publication; for the outlines of nations change with a frequency which are astounding and to an extent which are confusing in the "standard" atlas usually at one's elbow when it has occupied one's library shelves for some years, the numbers of which are unascertainable owing to the absence of the date of its publication on the frontispiece. Anaphylaxis and sensitization are such words, and the author found this the case in his own medical dictionary. He found on looking it up that he had written a note in pencil at some previous date and had to search elsewhere for it. He found it in Dr. Mitchell Bruce's "*Materia Medica*" in the recently issued number, 1922, by Dr. J. Mitchell Bruce and Dr. R. W. J. Dilling; and by the advice of Dr. Bruce and Dr. Arthur Latham's and Mr. Frank Coke's studies on the subject, especially the article on the subject of "Sensitization in 270 Cases of Asthma" in the *Practitioner* for August, 1922. The reason for his search was that in a diu way the writer thought that he had a recurrence of an illness which might be of the nature of an anaphylaxis, but now uncertain, if what is stated below, is really an anaphylaxis, the author gives it for what it is worth, seeing that to the uninitiated the whole matter is so extensive that the mists are still clouding the mental picture of a seven-day sufferer and at "visions are still about."

The reader may not, almost certainly will not, remember that in the leader of this *Journal* for August 1, 1922, p. 249, the same writer gave a rather lengthy description of what he termed *mushroom poisoning* in his own case, and to what many doubt regarded as a dubious conclusion, but which by several authors in America, Italy and Eastern Europe, &c., was commented on "apprehensively," let us say; similar cases having come under these writers' ken.

It is not necessary to recapitulate the signs and symptoms set forth in that leader, for they have pursued in exact form within the past week, so exact that my friend, Dr. Arthur Saunders, R.C.P., who saw the conditions on both occasions, can testify along with others to their identity. It was on July 9, 1922, that the first attack developed, one and a half hours after eating mushrooms. It ran through a course published as mentioned above, an exact *fac simile* of the one which flared itself on March 9, 1923—that is, eight months after the initial attack. During this time there were no signs of any sequelae.

Shortly, the recent recurrence was as follows:—The writer on the day in question at 12.30 p.m. had to go out to the house of a neighbour. The day was intensely cold, the wind was east, and shivering after a few minutes' exposure became marked. The rigors were aggressive and compelled his going

home to bed. The mouth temperature rose to 101.4° F. in a few minutes, and the rigors continued. Warm blankets, hot drinks and hot bottles failed to check the rigors, and the temperature by 3 p.m. rose to 102.8° F. Pain was present everywhere over the body. 5 gr. quinine and 5 gr. aspirin with 5 gr. Dover's powder were taken, but no relief obtained. At 5 p.m. sickness and vomiting came on for some seven to ten minutes, and pain became marked above the right ankle; on looking at the part a rash of erythematous hue was plainly visible and the limb swollen. The flushed skin and the swelling of the leg advanced co-laterally, until by 8 p.m. the whole right leg was greatly swollen from below the knee to over the ankle, but no redness of the foot.

Those attending to the patient (that is, the writer) were the same as those who saw him and attended him in August—three or four people—and all said it is exactly the same as the mushroom poisoning attack in 1922 in the country house in Hertfordshire. During the night restless, tossing about, talkative, not always coherent. During the second twenty-four hours: Temperature 101.6° F.; afternoon, pains universal, headache, especially on left side in the socket of left eye, which had been removed some four years previously; skin rash erythematous on right lower limb, identical in every way, outline, colour, subcutaneous oedema, solidity of parts, and even to the islets of rash outstanding from the main area exactly as they were eight months before.

In regard to the *inception of this recurrence*, it may be of importance—it may be of dominant importance—that at the very spot where the initial point of trouble arose in the autumn of 1922, namely, 3 in. above the right ankle on the front of the leg, the patient (the writer) sustained a wound of the skin by missing a step whilst going upon the lecture platform and "barking the skin"—that is, a piece of skin 1½ in. long and some 1 to 1½ in. wide was "barked" sufficiently to cause rather smart capillary hæmorrhage. The lecture was proceeded with, whilst the clothing was replaced on the wound, covered by a piece of dry boric lint. One hour afterwards the part was washed with warm sterilized water, dried with boric wool, the surface covered by *plain vaseline*, not carbolated nor prepared in any medicated fashion, and covered with sterilized oiled silk and bandaged. The part did not inflame, but the surroundings became markedly oedematous. This dressing was renewed once or twice daily, the part healed without suppuration, and in eight days time the part was healed. The healing was so speedy that "wise heads" said it had healed too quickly to be normal and safe. All went well for ten days after, but on that date the phenomena detailed above suddenly began on March 9, and for three consecutive days a repetition of the symptoms, local and general, in exactly identical form as occurred in the August, 1922, developed.

Was this recurrence due to the sensitization of

the skin which occurred in the autumn of 1922 during what was regarded as an attack of mushroom poisoning? Was the latent muscarine alkaloid presumed to be present and active, then stimulated, and the action on the vagus nerve-endings made manifest? That the two illnesses were identical is positive; and there was no repetition of the muscarine poison, for no mushrooms had been taken since. That it was a specific illness in both instances is undoubted, that the cause of the development, the seat of the lesion, the limitation of the skin rash in minute form identical, with a complete interval of eight months, are all abundantly proved. Had the writer not come across the article on "Sensitization" in the *Practitioner* the above would never have been thought worthy of attention. "Anaphylaxis" and "Sensitization in 270 Cases of Asthma" would have been regarded as an academic subject of interest merely.

The seasonal and yearly recurrences of certain ailments, especially of a vegetal kind, have been little more or less than fairy tales of "domestic" medicine, and until the other day has never reached a higher standard of research. The ailments have been regarded as mere idiosyncrasies, without an attempt to solve the riddles which have held mankind in the thrall of mystery from early times. Thanks to Coke, Latham, Walker, Widal, Abrami, &c., the barrier has been stormed, and we are on the high road to a better knowledge. The writer has been wont to quote an observation he made in Hong-Kong in 1892. He was summoned to two cases of acute illness in two men who seemed to be suffering from malaria fever. Closer investigation soon showed that the signs and symptoms were not explainable by infection by malaria, and the patients gave the key to the phenomena. They believed that they were due to "ivy moss" infection contracted whilst passing through a wood in the United States, where they were "poisoned" by this plant. Soon after they both came to Hong-Kong, and had what appeared to be annual recurrences of malaria, but closer investigation showed them to be suffering annually from the ivy moss or wood ivy poisoning at definite dates. This had gone on ever since they came to Hong-Kong, and they had not re-visited the U.S. for some eight years. The "poison" remained latent for all these years, and showed its presence at annually recurring periods. The same recurrences we find in malaria patients who have dwelt in the tropics and have not returned there for years. Time and again during these febrile attacks the blood is searched for parasites, and time and again they are not to be found.

Between medical men of long experience in tropical countries and who are now in practice in England, and by whom the blood is examined for parasites, a private understanding exists amongst the more experienced that the blood examination, although stated to be officially free from parasites, does not mean that malaria is not active. Privately they report the finding to each other: as we know

that to the public and to the uninitiated the absence of parasites does not signify what they hold the fact to mean. Anaphylaxis and sensitization phenomena in other infections will possibly explain this malaria phenomena as it is explaining several others due to "foreign protein infections of such harmless and non-toxic nature as white of egg, normal horse-serum, &c." (Latham and Coke).

The article in question in the *Practitioner* of August, 1922, was introduced as follows:—

SENSITIZATION IN 270 CASES OF ASTHMA.

By ARTHUR LATHAM, M.D., F.R.C.P.,

Physician to St. George's Hospital;

AND

FRANK COKE, F.R.C.S.

It is now established that there is a close analogy between anaphylaxis, as experimentally evident in animals, and the hay-fever, asthma, urticaria, and other complaints, occurring in asthmatic individuals and their cousins by birth and nature.¹ The chief points in experimental sensitization may with advantage preface this article.

1. If an animal is injected with a dose of some foreign protein and a sufficient incubation period of some ten days allowed to elapse, it is found that a second injection of the same protein will cause profound symptoms to take place, which may even lead to the death of the animal in a few minutes.

2. The foreign protein used may be of such a harmless and non-toxic nature as white of egg, normal horse-serum, &c.

3. The reaction is unquestionably a specific one. That is to say, if the albumen of a hen's egg is used for the first sensitizing dose, exactly similar albumen from hen's egg must be used for the second exciting dose, or no anaphylaxis will result.

4. Whatever kind of albumen or foreign protein is used to produce the anaphylaxis, the resulting symptoms are always the same for the same species of animal.

5. The symptoms vary in the different species of animal. In rabbits they are chiefly cardiac, in guinea-pigs bronchial, in dogs gastro-intestinal, and so on. In other animals, as monkeys, it is apparently very difficult to produce anaphylaxis at all.²

6. The typical picture of the various symptoms of anaphylaxis is as follows: Immediately after the second dose of the foreign protein, the animal becomes restless, it scratches its muzzle as if the were irritating; the respiration is quickened, the difficult; vomiting takes place, especially in dog there is diarrhoea and the passage of blood at mucus; micturition occurs; tetanic spasms at somersaults give place to paralysis and collapse; cessation of breathing brings death. There is, to a definite eosinophilia and other blood changes.

¹ Frank Coke: *British Medical Journal*, March 12, 1920; Arthur Latham: *Lancet*, 1922, i, 261.

² Zuisser: *Proc. Soc. Exper. Biology*, February 16, 1921.

Human beings often copy almost the whole of these symptoms on a smaller scale. Several striking examples occur in our series. Soon after being exposed to the article, food or animal hair, to which these patients are sensitive, their eyes will run and asthma will develop, sickness and diarrhoea will follow an hour later. Often a severe headache lasts throughout the next day, while an abundant urticarial rash makes its appearance some time during the seizure.

J. CANTLIE.

Annotations.

Increase of Dose as a Method of making use of old Vaccine (W. F. Harvey, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—Under the conditions of the trials made, no evidence is forthcoming that increase of dose will make up for loss, by age, or exposure to high temperature of the potency of a vaccine.

Leucocytic Secretions (Alexis Carrel and Albert Ebeling, *Journal of Experimental Medicine*, vol. xxxvi, No. 6, December, 1922).—The serum obtained from cultures of leucocytes is less inhibiting for homologous fibroblasts than the serum from media without leucocytes. In some experiments its hamolytic action on sheep or rabbit erythrocytes is also increased.

The addition of casein to leucocytic cultures brings about a decrease in the inhibiting effect of the serum on homologous fibroblasts.

The increase in the activity of homologous fibroblasts in serum obtained from leucocytic cultures is probably due to growth-promoting substances secreted by the leucocytes. The presence of a foreign protein under certain conditions determines a more abundant leucocytic secretion.

Report of an Outbreak of Bacterial Food-poisoning (W. D. O'Kelly, *The Journal of Hygiene*, November, 1922).—The author reports the third outbreak of bacterial food-poisoning in Ireland, which presents some unusual features; it was due to the consumption of infected milk, the causal organism being *Bacillus enteritidis* of Gaertner. A case of gastro-enteritis occurred in a patient some days previously. This man's serum possessed agglutinins for Gaertner bacillus, but the organism was not isolated from a specimen of his faeces taken forty-four days after this attack. This same patient is supposed to have been the source of the organism which infected the milk. Two hypotheses are put forward to explain the mechanism of the infection. Inhabitants of the same institution who took the infected milk in their tea escaped infection.

The milk was added to the tea in bulk, and the experiments described satisfactorily account for their escape.

The cultural characters of *B. enteritidis* of Gaertner are also given and the result of virulence tests.

Experiments in the Treatment of Malaria with Alkali combined with Quinine (J. A. Sinton, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—The results of the above experiments are at present incomplete and the number of observations small, but both the clinical and theoretical points which have been raised seem distinctly in favour of alkalies as adjuvants to the action of quinine in malaria.

A New Serum Test for Kala-azar (L. E. Napier, M.R.C.S., *Journal of Indian Medical Research*, vol. ix, No. 4, 1922).—About 5 c.c. of blood is withdrawn from the patient's arm and allowed to stand for a sufficient time for the serum to separate. 1 c.c. of clear serum is then placed in a small test-tube $\frac{1}{2}$ in. in diameter, to this one drop of 30 per cent. formaldehyde in the form of commercial formalin is added, the serum immediately well shaken, and placed in a test-tube rack at laboratory temperature.

The serum will immediately become viscid, within a minute or two will have "set," so that the tube can be inverted without the serum being spilled, and will begin to become whitish and opalescent. Within from three to twenty minutes, the time varying with different cases, the whole of the serum will have become absolutely solid and opaque like serum coagulated by heat or the "white" of a hard-boiled egg. If the serum is haemoglobin-stained the coagulated serum will have a pink tinge, which will turn chocolate-brown after twenty-four hours.

The Anæmia of Chronic Nephritis (George Brown and Grace Roth, *Archives of Internal Medicine*, vol. xxx, No. 6, December, 1922).—Evidence is presented to show that the anæmia of uncomplicated chronic nephritis develops in the absence of blood loss, and this anæmia is not due to excessive hemolysis.

Proof is not at hand to indicate that this type of anæmia is due to increased concentration in the blood of any known nitrogenous substance. Evidence is presented which indicates that the bone marrow suffers damage concomitantly with renal, retinal and cardiac tissues.

Chronic nephritis is a constitutional disease; accumulating evidence points to primary vascular injury of widespread distribution, renal, cardiac and retinal tissues and the bone marrow tissues reveal secondary effects of vascular disease.

The unknown agent causing renal insufficiency

is probably the aetiological factor in the disturbance of hamatopoiesis—in other words, a common cause is present.

The anaemia of chronic nephritis, if present to the degree indicated, has a prognostic value similar to that of certain creatinin retention.

Some Aspects of Scurvy in the Native, and its Treatment by Orange Juice Intravenously (S. Donaldson, *South African Medical Record*, January 13, 1923).—The author describes the two different types of scurvy existent in South Africa, chiefly in the mining districts, and gives the following simple method of treatment:—

The fresh fruit, thoroughly cleansed with ether, is divided with a sterile knife, and the juice rapidly expressed by means of an ordinary potato masher, and strained a few times through several layers of fine sterile butter muslin until free from pulp debris. The required dose is then neutralized, or preferably—bearing in mind the destructive action of alkalinity, as well as prolonged heating on vitamines—brought to a faintly acid reaction with a solution of sodium hydroxide (1 in 10) and diluted with a suitable amount of normal saline, and is then ready for injection into any accessible vein in the arm.

An initial dose of 10 c.c. repeated daily or on alternate days, increasing by 5 c.c. until 25 c.c. or 30 c.c. is reached, has always given good results.

Observations upon the Possibility of Schistosomiasis becoming Established in Australia (Frank Milton, *Medical Journal of Australia*, October 4, 1922).—Schistosomiasis is believed to have been introduced into Australia by troops stationed in Egypt, where the disease is endemic, and who were repatriated while still passing living eggs of the parasites in their excreta. The symptoms are of so mild a character that the disease has been latent in many cases for three or four years. The mature parasite can survive and go on producing fertile eggs for a period of from twenty to twenty-five years. The human schistosomes are digenetic trematodes of three distinct species: *Schistosoma hematobium*, *S. mansoni* and *S. japonicum*; they develop in fresh water molluscs of the genus *Bullinus* and *Planorbis*. *S. mansoni* has been found to adapt itself to five different species of *Planorbis*, and *S. hematobium* probably to two species of *Bullinus*.

In 1920 Annie Porter discovered in South Africa that *S. hematobium* had adopted as its common host *Limnæa natalensis*, a pulmonate mollusc of a very different family to both *Planorbis* and *Bullinus*. As these three species of molluscs are indigenous in Australia, the danger of the establishment of schistosomiasis as an endemic disease is imminent.

Syphilis and Marriage (R. Prosser White, *The Practitioner*, November, 1922).—The author confirms the statements of Findlay and McDonagh on this subject, and is of the opinion that if the patient undergoes expert treatment before disease has become generalized, 90–95 percent. will be cured. For persons in the secondary stage repeated injections are necessary, and three years must elapse without relapses before marriage is sanctioned. In the case of a syphilitic pregnant mother, if early prophylactic or abortive treatment be administered she will usually bear healthy children.

Smallpox Vaccination in Java (W. F. Harvey, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—Dr. Nijland's method of production of vaccine lymph is well worthy of trial in India, and offers very considerable prospect of success. It is as follows: The principle underlying the method is that no vaccifer shall be inoculated with lymph derived from the same species of animal. Under these conditions degeneration does not take place. Three species of vaccinifers are used, the rabbit to provide lymph for inoculation of the cow-calf, and the cow-calf to provide stock-lymph for inoculation of buffaloes. The buffaloes thus provide the lymph which is used in the field. This lymph can be issued by ordinary post, can be sent far afield, and without loss of potency. It is diluted at the time of use by the vaccinator, and this diluted lymph preserves its potency for two or three days.

Bovine Actinomycosis: Its Pathogenesis and Treatment by Vaccines (W. M. Scott, F.R.C.V.S., *British Medical Journal*, vol. xxxii–xxxiii, December, 1922).—The bacteriology of the group actinomycosis is most complicated and unsatisfactory, giving ample scope for the joint action of human, comparative and plant pathologists. If the parasite does live a separate life outside the animal tissues, its haunts and habits should be investigated, for until this point is cleared up preventive measures must ever be empirical.

How the salts of iodine act therapeutically in cases of actinomycosis is an interesting field for speculation, and possibly by investigations carried out along these lines other side tracks in the large field of chemical therapy might also be discovered.

Although the clinical data of actinomycosis are generally based upon an even and more or less regular plane, the same observation cannot be applied to the causa causans, this latter being most diverse and confusing. It must be confessed, however, that cases are seen in practice occasionally which simulate actinomycosis and are not so save in macroscopical appearances only.

Vaccine therapy is a valuable adjuvant in therapeutics, virulent antigens giving by far the best and most uniform responses.

Abstracts and Reprints.

A CASE OF PERSISTENT INFECTION WITH *BACILLUS DYSENTERIÆ* (FLEXNER).¹

By N. PAUL HUDSON.

A PERSON who harbours pathogenic bacteria, but who manifests no indication of infection, is known as a healthy or true carrier. The best examples of such persons are seen among those who harbour intestinal pathogens. If, however, the person occasionally presents recurrent symptoms he might not be considered a true carrier, but rather as presenting a chronic case with intermittent manifestations of the disease. A definite distinction cannot be made between the two conditions. A review of the current literature of the last twenty-five years discloses a relatively small number of accurately diagnosed instances of either true carriers or of persons having chronic cases of dysentery. Those persons who harbour the Flexner type of dysentery bacillus are usually more common; their condition is less persistent, and the bacillus is discharged less regularly than in carriers of the Shiga type.

Both the true carrier and the person presenting the chronic case have been incriminated in the spread of dysentery, especially in military organizations and in institutions; and also in epidemics of infant diarrhoea caused by this group of organisms. The importance of the detection of such an individual in the interest of the community, as well as of himself, is thus evident. If he is a true carrier, an accurate bacteriological diagnosis is accidental or the result of an epidemiological study. If he has a chronic case, however, his attacks, although intermittent, may bring him to the attention of an investigator. The infrequency of finding true carriers, and especially chronic cases of the Flexner type, has led MacAlister, on the other hand, to conclude that the carrier in dysentery is very rare and is negligible from an epidemiological standpoint. He considers the convalescent the dangerous factor in the spread of this disease.

The irregularity of symptoms and of the discharge of dysentery bacilli necessitates repeated examination of the stool. Likewise, a series of negative results should be obtained before the dysentery convalescent is released. Because of this uncertainty of isolation of the infectious agent, most writers recommend that the serum of the suspected person, whether he is a carrier or whether he has a chronic or an atypical acute case, be examined for specific agglutinins. Early in the disease, however, the antibodies may not be found; and since their persistence is irregular, the test cannot be taken as reliable evidence of continuation or of the cessation of infection. The case under attention was of special interest because of the relatively few cases

of persistent infection with the Flexner type of dysentery reported in this country, and because of the apparently extended existence of the organism in the intestinal tract, if it can be assumed that the organism recently isolated had had an ætiologic relation to the symptoms since their onset.

In this case of dysentery the symptoms of violent diarrhoea and weakness occurred intermittently for about three and a half years after the onset (June, 1918). A strain of *Bacillus dysenteriae*, Flexner type, was isolated during the latest acute attack (January, 1922). This organism was not found subsequently in a period during which symptoms were absent, and even after the use of a laxative. Possibly a relation exists between the organism isolated and the appearance of the "clay stools," in 1919; and it may be reasonably conjectured that there was an infection of the gall-bladder or the bile duct at that time, with temporary obstruction.

Specific agglutinins for the Flexner type of dysentery bacillus were found in the blood of the patient, but none for the Shiga type. This agglutination test was made about 145 days after the last appearance of the symptoms and the successful bacteriological examination of the faeces. The persistence of agglutinins for at least 145 days and the absence of continuous positive cultural findings indicate the value of the agglutination test in the detection of carriers or of persistent chronic cases of the Flexner type of dysentery. The recovery of the pathogen only at the time of the appearance of symptoms points not only to the chronicity of the infection, but also to the possibility of an alteration in the resistance of the host.

THE SITUATION OF THE MALARIAL PARASITE IN RELATION TO THE RED BLOOD CORPUSCLE.¹

By Major J. A. SINTON, M.D.

THE fresh red blood cell is a biconcave disc which is on an average only 2.5 microns thick at the periphery and 1.5 to 2 microns thick at the centre, and must be even thinner in dried films. With a cell of such thinness it seems that the same optical appearance would be obtained whether the parasite was attached to the upper or under surface of the cell, or whether it was inside the cell, and that it would be impossible to say whether a parasite situated in the same perpendicular plane as the cell, was inside, above, or below the cell, just as it is impossible to say from optical appearances whether a blood platelet is on, in, or below a red cell.

If one could increase the thickness of the cell or change its shape so that it did not lie on one of

¹ Abstracted from the *Journal of the American Medical Association*, vol. lxxix, No. 20, November, 1922.¹ Abstracted from the *Indian Medical Gazette*, vol. lvii, October, 1922.

its concave surfaces as in the ordinary thin film, one should be able to get a much clearer idea of the true position of the parasite in relation to the red cell.

The shape of the red cells can be changed by varying the concentration of the medium in which they are. Thus Starling (1920) says: "If the blood is concentrated by evaporation or by the addition of neutral salts, its osmotic pressure rises and water diffuses from the corpuscles into the plasma, in order to equalize the osmotic pressure within and without the corpuscle. The latter, therefore, becomes wrinkled and crenated. On the other hand, dilution of the plasma diminishes its osmotic pressure below that of the corpuscles, and water therefore passes into the latter, which swell up and become spherical; and if the plasma be made sufficiently dilute the corpuscles burst with the liberation of the hæmoglobin they contain."

Schafer (1920) also says: "The ordinary observed effect of such lowering of tonicity of the surrounding medium on the biconcave red blood cell of mammals is that at first it assumes a cupped and then a globular form."

A series of experiments were conducted on these lines, and results obtained which it is impossible to explain satisfactorily, except on the hypothesis that the subtertian and the benign tertian malarial parasites are, for the most of their asexual cycle in the human host, attached to the outer surfaces of the red blood cells.

EFFECTS OF CHRONIC STARVATION DURING THE SIEGE OF KUT.¹

By Major-General Sir PATRICK HENRY, K.C.I.E., C.B., C.M.G.

The siege of Kut lasted 148 days, from December 4, 1915, to April 29, 1916. The besieged garrison consisted of the 6th (Poona) Division, supplemented by various details. The strength on December 8, 1915, was 14,586. This included British officers, 218; British rank and file, 2,534; Indian officers, 175; Indian rank and file, 8,117; followers, 3,542. Of this number, 1,508 were sick and wounded in hospital.

THE RATIOMS OF THE KUT GARRISON.

To grasp the state of nutrition of the garrison towards the end of the siege it would be well to bear in mind the usual classification of foodstuffs, the physiological bases upon which rations for bodies of men such as soldiers are formulated, and the functions carried out by each class. The rations of the British soldier in Mesopotamia before the siege had a heat equivalent of 3,600 calories, that of the Indian 3,100 calories.

The Protein Factor—British troops did comparatively well as regards their protein ration during

the siege. When fresh beef and bouilli were exhausted they were given 1 lb. of horseflesh, which was increased to 1½ lb., next to 1¼ lb., and then to 1½ lb., but finally reduced to 1¼ lb. again. While the ration of bread was not below 10 oz. and the butter and bacon ration continued, this amount of horseflesh prevented any rapid loss of weight or stamina, but when the loaf was reduced to 8 oz. and all butter and bacon ceased, they began to lose flesh and condition rapidly—the oxidizable material in the bread and horseflesh combined was insufficient, and they started using part of the protein of their muscles for the production of force and maintenance of the temperature of the body. In Indians, except those who had eaten horseflesh from the beginning, the muscles began to waste rapidly as soon as ghi underwent a serious reduction, and in all except those who were highly developed physically at the beginning of the siege the muscles dwindled considerably.

The Hydrocarbon Factor.—From a physiological point of view, the most serious deprivation suffered by British troops was the absence of hydrocarbons. Bacon and butter failed at a comparatively early stage of the siege. In ordinary circumstances this would have been to some extent compensated for by the large ration of horseflesh allowed, and at the beginning this was so, but during the last ten weeks of the siege the animals themselves were in such a state of starvation that no fat remained on their tissues. They could not go out to graze under fire.

From about the end of March British troops were definitely in a state of partial starvation, and were losing ground daily; they were lacking in energy, debilitated, and incapable of any serious strain. The Indian troops received a progressively reduced ration of ghi, which was only 1 oz. daily from March 11, and ceased altogether early in April. Until the second week of April only about one-ninth of the Indians were eating horseflesh, so that the small amount of fat obtained from this source is almost negligible. Indian troops had by that time reached an advanced stage of chronic starvation; their energies were markedly reduced, they were debilitated, less capable than the British of any severe strain, and they possessed little resistance to disease.

The Carbohydrate Factor.—The greatly reduced ration of the garrison in carbohydrates (the average reduction of bread in British troops during the five months of the siege was 50 per cent., and of the atta of Indian troops 66 per cent.; during the last six weeks neither sugar, gur, butter nor ghi was available) led to the removal of nearly all glycogen from the liver and muscles, so that the amount of stored material readily assimilable in the tissues for energy and heat production during the penultimate fortnight of the siege was at a minimum. This fact was demonstrated by the ease with which the men became fatigued, their inclination to remain at complete rest whenever opportunity

¹ Abstracted from the *British Medical Journal*, June 3, 1922.

offered, and the speed with which they collapsed, with a marked subnormal temperature, when they had the misfortune to get an attack of diarrhoea or any other malady causing a drain on the system. It likewise helped to explain how difficult it was to restore the heat of the body once it was lost. British troops especially felt the want of more bread, which forms a large part of their food normally; they also had urgent cravings for fat and sugar; there was a very marked yearning for tea. In the same way Indians had a great longing for more chuppatties and gur.

Inorganic Salts.—Shortage of salt in the rations of both British and Indian troops and followers began about the middle of the siege, after which time the salt issue underwent great reduction, the troops receiving only about one-eighth of the normal ration. Early in April it ceased altogether, except for a small issue made for a few days from some bags of salt that were dropped into Kut by aeroplanes. I was not able to gauge satisfactorily the extent to which this deprivation affected the nutrition and health of the troops. It is possible that some of the cases of diarrhoea and gastrointestinal disturbance that prevailed during the last two months of the siege were partly attributable to a want of sufficient salt in the food.

It is well to bear in mind the very important differences between acute starvation, in which there is complete and sudden deprivation of all food, and chronic starvation such as we went through, in which there is continuous use of an insufficient supply of food of a kind unsuitable to maintain the normal standard of nutrition. In acute starvation until death actually happens it is possible to restore the victim to health and strength once more by an appropriate regimen; in chronic starvation a stage is eventually reached, sometimes weeks before death, from which recovery is impossible.

Loss of Weight in Chronic Starvation.—During the nineteenth week of the siege I had the weight of 400 healthy British and 800 healthy Indian troops at duty taken with the view to ascertaining the average loss during the siege. The weights were taken on the same scales, at the same time in relation to meals, and in the same kind of clothes. British troops on an average lost 12.5 lb. per man, and Indian troops 17 lb., which was, roughly, a loss of 10 per cent in weight in the former, and 14 per cent. in the latter. Personally, I started the siege weighing 10 st. 6 lb., and at the end of it weighed 8 st. 11 lb.; my normal weight is 10 st. 12½ lb. The loss of weight reached its maximum in officers and men who began the siege with a superabundance of fat, and it may be remarked that they stood the loss well. The average loss of weight given above was that which occurred during the siege. It may not appear excessive, but, as stated in the introduction, the force had immediately antecedent to the siege lost a certain undetermined amount of weight from hardships and privations. The average weight in one platoon of

Rajpoots on April 16 was 7 st. 12 lb., and in one of Jats 7 st. 10½ lb., as compared with their normal weights of 9 st. 3 lb. and 9 st. 1 lb. respectively.

Lowering of Body Temperature in Chronic Starvation.—In chronic starvation the temperature tends to fall very gradually. The temperature of healthy British and Indian troops during the three days, April 17, 18 and 19, 1916, was lower than normal. The average morning temperature in 200 British troops was 96°-130° F., and in 260 Indian troops 95°-84°. The average evening temperatures in the same men were: British, 97°-41°; Indians, 97°-03°. These observations were accurately made and the usual precautions to eliminate error adopted. In some cases in hospital the temperature was less than 90° F. just before death. We had Indians going about at duty with temperatures between 94° and 95°. My own temperature was never above 97° for the last six weeks of the siege, and during the last fortnight it varied from 96° and 96°-89°. I was seemingly in good health, but the effects of short commons. We did not meet with the great diurnal variations or fluctuations of body temperature that have been recorded in some cases of acute and chronic starvation.

Inclination to Sleep in Chronic Starvation.—During the last days of the siege there was an increased tendency to sleep, a greater lowering of temperature, and a still slower pulse-rate. If any disease (such as severe diarrhoea) intervened, these phenomena were exaggerated, and death rapidly ensued. During the later periods of slow starvation there is practically no actual suffering even when such a disease as dysentery is present. In fatal cases so imperceptibly does life ebb away that it is sometimes not easy to say whether the man is really dead or not.

Reduction of Pulse-rate in Chronic Starvation.—It is sometimes stated that the rate of the pulse continues practically normal until a few days before death from chronic starvation. This is not the case. In the nineteenth week of the siege the average pulse-rate in 200 odd cases in whom observations were continued thrice daily for a week was nine beats less per minute than normal. After the middle of April in many men the pulse-rate was suddenly increased on the occurrence of impending danger, during an attack by the enemy, or an exceptionally severe strafing from aerial bombs or even small-arm fire. The same occurred during severe exercise. A very slow pulse-rate, from 30 to 40 per minute, was met with in many cases, both in hospital and at duty.

Mental Attitude of Garrison during the Siege.—During the first two months of the siege both British and Indian troops were moderately cheerful; for the next six weeks or so they were more subdued. For the last month, without being depressed or melancholy, they become somewhat cheerless, and during the last fortnight manifestations of mirth and vivacity had disappeared. Personally, I was astonished at the patience and forti-

tude with which the garrison endured the terrible hardships they went through. I was amongst the men practically every day from the beginning to the end of the siege, and write from intimate knowledge of the conditions. The grit shown by our British and Indian soldiers was beyond all praise. "The behaviour of the men in meeting the unfortunate circumstances in which they are placed is heroic." (Diary, April 25, 1916.)

CHIEF DISEASES DURING THE SIEGE.

Diarrhoea.—This was by far the most prevalent disorder met with during the siege. The essential cause in all these cases was chronic starvation. The men had got into such a state of debility and wasting from shortage of food that any added strain on the economy, such as diarrhoea, was sufficient to lead to speedy dissolution. The disease continued epidemically after we got to the prisoners' camp, Shamran, where during May we had over 1,500 cases and about 200 deaths from it.

Dysentery.—A large number of diarrhoea cases merged into a form of dysentery that might pathologically be called catarrhal. The total number admitted into hospital with the clinical symptoms of dysentery was 684. There was besides a large number of slight cases treated regimentally; it might indeed be stated that it attacked a very high percentage of all ranks of the garrison at one time or another during the siege. It was relatively more frequent in Indian than British troops, and was of less severity and associated with a lower mortality and more amenable to treatment in the latter. Pathologically, it varied in its intensity from a mild catarrhal inflammation to widespread destruction of the large bowel, and even of the lower part of the small intestine. In the penultimate and final stages of the siege medical officers were unanimously of opinion that the disease did not yield to treatment as satisfactorily as in the earlier stages. The symptoms and course of the disease were something like those of bacillary dysentery, but its real bacteriological relations, if any existed, were not determined.

This condition was a particularly fatal terminal complication of scurvy.

Chronic Starvation Debility.—There are reasons for considering that there is a definite pathological state with a fairly well-defined clinical course in chronic starvation debility. A general weakness without any assignable cause except the defects in the rations was naturally the commonest condition met with in the siege, and finally affected the entire garrison. It assumed graver forms in Indians than in Europeans. We noticed in hundreds of Indians that there is a stage in the downward path in chronic starvation from which recuperation cannot take place, that after the effects of starvation had reached a stage that is difficult to define, recovery was hopeless, as no possible measures appeared to have the power of restoring the victim.

Scurvy.—Indian troops went through a serious

outbreak of scurvy. During the siege it caused 1,050 admissions. A few cases appeared early in January; the incidence gradually rose, and in the middle of January we had 140 cases in hospital; at the end of March there were 597 cases under treatment, after which time it gradually declined. These do not include the incipient undeveloped cases which for military reasons were obliged to keep at duty, nor the latent cases. With the exception of chronic starvation itself nothing undermined the stamina of the Indian troops more than scurvy.

The essential differences between the diet of British and Indian troops were that British ate horseshesh, and Indians until near the capitulation did not; Indian troops used dhall and British did not; British used white flour or biscuits made of it for a large part of the time, Indians used atta or coarse barley flour. The British got beriberi and no scurvy, the Indians got scurvy and no beriberi.

Beriberi.—This disease gave rise to 155 admissions in Kut, all in British troops.

TREATMENT OF CHRONIC STARVATION.

It is essentially necessary after long periods of partial starvation to exercise the greatest caution and discretion in returning to ordinary food. Death frequently occurs in those who after forced abstinence of some duration suddenly and completely gratify the natural cravings of hunger. The whole digestive apparatus is in a weakened state, and the various glands in and around the intestines that take part in the process of digestion have undergone atrophy, and their functioning power has to be restored before they can resume work normally. The activities of the digestive organs and metabolic processes have necessarily been sluggish, and any sudden demands made upon these functions are liable to be followed by a breakdown in the machinery. The main indications in attempting to restore those in advanced starvation are: maintenance of the warmth of the body and the administration of readily assimilated warm liquid nourishment. Rest and the application of warmth (if the weather requires it) are very comforting.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE,
November 8, 1922.

The Morphology and Evolutive Cycle of a Herpetomonas in the Intestine of a Hemidactylus brookei Gray (Froilino de Mello and Crisna Suctancar).—A herpetomonas observed in the intestine of *Hemidactylus brookei* in the resting stage, is found as (1) a round form with a nearly central nucleus and a deeper coloured kinetonucleus near the nuclear membrane; (2) a ciliated herpetomonad, visible centriole and a kinetonucleus attached to the basal granule.

Details of a process of mitosis are described and illustrated.

A Further Note on the Subject of Filarial Itch (J. Montpellier and A. Lacroix).—MM. J. Montpellier and J. Lacroix, in answering the note of MM. Ouzilleau, Laigret and Lefrou (*Bulletin de la Société de Pathologie Exotique*, No. 10, 1921), differ from these authors on several points. M. Ouzilleau and his collaborators state that embryos are found in all cases in teguments containing filarial cysts, but the biopsies carried out in about 150 cases of Montpellier and Lacroix have always given negative results.

They also attribute cutaneous lesions in dermic onchocerciosis to the action of the embryos in the teguments, but Montpellier and Lacroix state that the lesions are due to scratching.

Filarial itch is very different clinically from scabies and other prurigos; details of diagnosis were given by the authors in No. 10, *Bulletin de la Société de Pathologie Exotique*, March, 1922.

A Contribution to the Study of Stephanurosis in Pigs (C. Nicolas).—Specimens of *Stephanurus dentatus* were found in the adipose tissue in the vicinity of the urinary organs, from the kidneys to the bladder, of a pig in New Caledonia; a few small nodules were seen on the liver.

Morris (1871), Bancroft (1893), and Johnson (1921) observed stephanurosis in pigs in Australia, and the author suggests that it has been introduced into New Caledonia from Australia.

Pigs infested with these parasites are fit for human consumption, but the infected organs (liver, &c.) must be thrown away.

Blue Patches and Salivary Glands of Phthirus Inguinalis (E. Pawlowsky and A. Stein).—Experiments carried out with the extracts of the salivary glands of *Phthirus inguinalis* proved that the extract of the glands of renal shape cause blue patches in man. This extract does not resist the action of heat, and acts on white men as well as on natives.

The Hedgehog and Rabies Virus (Mme. M. Phisalix).—The action of rabies virus was tried on four hedgehogs of different ages and sizes. These animals show a remarkable immunity to several venoms and certain microbic toxins.

In the first three animals the inoculations caused acute rabies fifteen to seventeen days after inoculation which took a markedly different course in each case but terminated fatally; the pathological changes found on autopsy also varied greatly.

The fourth animal showed only slight paralytic phenomena on the eighty-fourth day and recovered spontaneously.

Development of Hæmoproteus Columbræ (G. Senévet and P. Witas).—The authors confirm the observations of E. Sergent and M. Beguet who discovered the reappearance of hæmoproteus gametes in the blood of pigeons during two or three consecutive summers, and are of the opinion that a Hippoboscide of the *Lynchia* genus is the intermediary agent of this parasite.

A pigeon kept in a cage for observation and carefully protected against reinfection, from one month after birth for two years, showed that the incubation period of *Hæmoproteus columbæ* is twenty days. The gametes in the blood become very small and the parasites increase in number; when they grow they become fewer and eventually disappear entirely. After twelve days very small gametes appeared which increased and went through a similar cycle. Throughout one period of 146 days the blood was apparently free, after which gametes reappeared.

Morphology of Piropasmas observed in Sheep in Algeria (Gonderia ovis) (E. Sergent, L. Parrot and D. V. Hilbert).—Imported Southdown rams often die from piropiasmosis in Algeria. The parasites found in the red corpuscles are round or of a polygonal shape; ring forms may be present; some parasites show binary, ternary or quaternary division. The authors place this parasite in the genus *Gonderia*.

The Treatment of Guinea-Worm by Antimony Salts (E. Tournier).—A report is given of seventeen cases of guinea-worm successfully treated by emetin given intravenously and by the mouth.

Plasmodium Falciparum Malaria: Diagnosis and Treatment (E. Bran).—In the author's experience many cases of so-called seasonal fevers, &c., are in reality of malarial origin.

Malaria should be suspected in the presence of a proportion of at least 10 per cent. of large mononuclears in a differential count of about 300; even in the apparent absence of gametes or of schizontes in the peripheral blood. Quinine should be given by enema where the intravenous injection is not absolutely indicated. The administration of quinine *per rectum* is preferable to quinine taken orally in the height of fever.

Cases of Splenomegaly and Kala-Azar in Natives of Egypt (Mme. A. Panaytatou).—Eight cases are reported of febrile splenomegaly in Egypt. Three cases were found to be positive for *Leishmania donovani*; the fourth was positive for malaria parasites; the fifth for hereditary syphilis, and the other three cases were suspected of kala-azar although microscopically negative for leishmania.

Human Gnathostomiasis. Ambulant Edema in Siam due to Gnathostomum Spinigerum R. Owen, 1836 (L. Robert).—The presence of *Gnathostomum spinigerum* in human cases in Siam was first described by Deuntzer, and also by Kerr. The author reports a case in which a male gnathostomum was expectorated by a patient in a fit of violent coughing. The patient was in good health and showed no symptoms of disease.

In two other patients suffering from a peculiar type of oedema, which started in the hand and spread to the leg, a female gnathostomum was extracted from under the skin. Gnathostomiasis rarely affects men, and never affects children under 12 years of age, of either sex.

A detailed description of this parasite will be given in a special note later.

Researches on the Elimination of Calcium in Leprosy (A. Boulay and M. Leger).—Contrary to the generally accepted opinion, researches by Underhill, Honey and Bogert showed increased calcium retention in two cases of leprosy. The present authors have studied three cases among the natives of North Africa, and found great individual variations in the elimination of calcium under uniform dosage. Apparently, excretion increases as the disease advances, and there is more than average retention in the early stages. Further investigations are in progress.

The Ossification of the Choroid (G. Hudellet).—The atrophied right eye of a patient which had been operated upon for cataract unsuccessfully at the age of 6, was removed when he was 36 because of trouble present in the other eye. The choroid coat was found to be completely calcified. The mass consisted of calcium carbonate with a little phosphate.

On an Extremely Virulent Pseudo-Plague Coccobacillus (M. Leger and A. Baury).—This pathogenic germ was isolated from a small abscess of the kidney of a Senegalese. It does not correspond to organisms hitherto described, and the authors have named it *Bacillus pessimus* until further investigations have been made.

Experiments carried out with the pus of the patient caused the death of guinea-pigs, rabbits and mice.

It grows on ordinary media and is Gram-negative. In stained preparations small bacilli of uniform colour with rounded ends are seen.

Quinine in the form of Compressed Tablets, and its Elimination by the Urine (M. Leger and E. Bedier).—The authors recommend compressed tablets as the best way of taking quinine, being of uniform dosage.

The results of experiments carried out on healthy and malarial subjects were contrary to those of M. Blanchard. The elimination of chlorhydrate of quinine in the urine, after taking tablets of three different manufactures, began after three to four hours in 91 per cent. cases, and in 99 per cent. cases after six to eight hours.

On a Case of Tuberculosis observed in a Zebu in the Slaughter-house at Dakar (Nainsouta).—A caseo-calcareous lesion, the size of a hazel-nut, was discovered in one of the bronchial ganglia of an ox in Dakar. Microscopical examination showed it to be of a tuberculous nature. The pulmonary tissues and other organs were free from lesions. This is the first case, out of numerous investigations in cattle made by the author, which has given positive results, and is the third authentic case of bovine tuberculosis observed in French West Africa. The first two cases were discovered by Curasson (1920) and Teppaz (1922).

Plague at Dakar (H. Lhuette).—Seventy-six cases came under observation during the endemo-epidemic period, October, 1921, to October, 1922; nine succumbed within twenty-four hours, the remainder were studied and classified as bubonic (simple and with complications), pulmonary and septicæmic.

The author comes to the following conclusions:

- (1) The old classification which included a septicæmic form proves correct.
- (2) In the present state of knowledge it is not justifiable to speak clinically of primitive pulmonary plague simply because of the absence of an external bubo.
- (3) Pulmonary forms are as frequent as bubonic.
- (4) Pulmonary forms can get cured, at least, in warm countries.
- (5) Anti-plague serum is very effective but must be used with skill, in conjunction with other forms of treatment.
- (6) The dosage of serum varies according to the condition and age of the patient.

Correspondence.

UNDULANT FEVER IN THE ANGLO-EGYPTIAN SUDAN.

To the Editor of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—I have read with much interest the account given by Major R. G. Archibald, D.S.O., in your issue of February 15 as regards an unusual and fatal case of undulant fever contracted in Khartoum. His paper is a very useful one, but the case he records is not the first to arise in Khartoum itself. When I occupied the position which Major Archibald now so ably fills, the blood of a case was sent to me for examination, and agglutination tests clearly showed it to be one of undulant fever. I have not the records here, but I distinctly remember that the man, an employee in the post office, had never been away from Khartoum, and that he must have become infected there. These sporadic cases are difficult to explain and show, as Major Archibald indicates, how important it is to carry out laboratory investigations in all cases of febrile attacks.

In his references Major Archibald has not mentioned a paper by Bousfield, who, in the *Journal of the Royal Army Medical Corps* for December, 1908, recorded a series of nineteen cases, mostly from the Kassala district, which he considers to have been almost certainly due to infection with *Brucella melitensis*, and one of which was fatal. Amongst the complications cancerum oris and severe diarrhoea were noted.

Major Archibald and I referred to this paper in the Second Review Supplement of the Khartoum Laboratories (1911).

I am, yours faithfully,

ANDREW BALFOUR.

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Original Communications.

CASTELLANI'S BRONCHO-SPIROCHÆTOSIS, PNEUMONIC AND ASTHMATIC VARIETIES; X-RAY EXAMINATION: TREATMENT WITH INJECTIONS OF IODINE.

By NAJIB FABAH, M.D.

Formerly Instructor in the American School of Medicine, Beirut.

HISTORY AND CLIMATOLOGY OF THE DISEASE.

BRONCHO-SPIROCHÆTOSIS, a peculiar form of bronchitis and its causal agent, the *Spirochæta bronchialis*, were first described by Castellani [1] in Ceylon in 1905 and 1906. The disease was later found in the West Indies by Branch [2] in 1907; in the Philippine Islands by Jackson [3] (1908); Phalen and Kilborne [4] (1908) and Chamberlain [5] (1911). Waters [6] described it in India in 1908; Taylor [7] (1914) in Uganda; Harper [8] (1914) and Macfie [9] (1915) in West Africa; Fantham [10] (1915), Chalmers and O'Farrell [11] (1916) in the Sudan; Hallenberger [12] (1916) in Cameroun; the writer [13] (1918) in Egypt, in the city of Alexandria; Lurie [14] and Wassell and Faust [15] in China.

In North America, the disease was first observed by Rathwell [16] in 1910 and was later recorded by Petters and Hall in Missouri and Ohio. In South America it was reported by Villa [17] and later by Corvetto [18].

In Europe, Castellani first recorded it in the Balearic-Adriatic zone in 1915, and later found cases in England. Also in 1915 Galli-Valerio [19] and Lurie observed cases respectively in Switzerland and Serbia; and in 1918 Dragotti [20] in Italy. Violle [21] was the first to report it in France, in St. Mandrier's Hospital in Toulon, 1916, where he found it attacked not only colonials but even Europeans who had never been in tropical countries. Barbary [22] later found cases in Nice, Darrien [23] in Montpellier, Sabrazès [24] in Bordeaux, Salomon [25] in Normandy, Simon and Raditsch [26] in Nancy, Netter [28], Beau, Dide and Ribereau [29], Pagniez and Ravina [30] and others in other parts of France. Nolf and Spehl [31] observed it in the Belgian army, many others are constantly reporting it from other parts of Europe, and the writer has been able to observe cases among Russian refugees that have recently arrived in Egypt.

From an epidemiological standpoint, the writer believes that the affection is quite common to all countries, and therefore with close investigation it would be small wonder if cases of rhinitis, pharyngitis, tracheitis, bronchitis and other respiratory affections were found to be due to Castellani's spirochæta. As a matter of fact, the writer has of late observed four cases of asthma of spirochætic origin, and believes that asthma of this type has not yet been recorded. Taylor, Macfie and Grimault [32] observed it in pneumonic cases. The writer also treated a fatal case of migrating pneumonia with high temperature, very probably of spirochætic origin,

as no pneumococci nor tubercle bacilli nor any other pathogenic germs could be detected in the expectoration, and animal inoculation for tuberculosis was negative, whereas spirochætes were found in abundance. Mühlens [33], Küster [34], Paraf [35], Ghon [36], Chamberlain, Weil [37] and others have as well reported it in pulmonary gangrene. All this undoubtedly tends to prove the widespread and the multiform manifestations of the infection, and what important rôle Castellani's spirochæta is actually taking in the pathology of the respiratory organs. Every keen observer should, therefore, be on the look-out for it.

LABORATORY CONSIDERATIONS.

It is to be remarked that the nose, mouth and throat of every patient to be examined should be inspected for the presence of any lesions, and the expectoration should be collected, in a sterile receptacle, after having his mouth well rinsed and gargled with an antiseptic solution. The sputum is then carefully examined and cultures prepared.

From an ætiological point of view it has been so far sufficiently established that Castellani's *Spirochæta bronchialis* is the real causal factor of the disease. The parasite is rendered visible either microscopically in dried coloured preparations or ultramicroscopically in the fresh state and is found in great numbers in the expectoration of patients affected with the malady. The writer has also been able to detect it in nasal and throat secretions of patients suffering from the same affection, and it is more than probable that the spirochætic infection is propagated from the nasal passages to the lungs in these patients. Castellani was the first to find spirochætes in nasal secretions; Loygue, Bonnet and Peyre [38] also found them in the naso-pharynx.

Castellani's spirochæta was never found in the blood, cerebrospinal fluid, urine or faeces of patients suffering from bronchospirochætosis. It has only been found in the expectoration, and its presence in abundance gives rise to no doubt as to its pathogenic rôle in the respiratory passages. However, Salomon and Neveu [39] were able to find spirochætes in the urine of patients suffering from war nephritis, and by Lancereaux [40] in pleural effusion, and it is doubtful whether these organisms are the same as the bronchial type. It is occasionally found with other broncho-pulmonary affections, and its presence may be so scanty and futile as to be altogether discarded; whereas in other cases it exists in abundance and then the infection is looked upon to be an associate kind. The writer, as others, has been able to observe it with phthisis, moniliasis, &c., and this kind of association is not at all infrequent.

As to the morphology of Castellani's spirochæta, Fantham in 1914 made a thorough study. He described the parasite as a spiral organism endowed with very animated and serpentine movements. In some, he described the presence of "Crista" which is a sort of a periplasmic prolongation by means of which the movements of the organism are executed. The movements of the parasite stop a few hours

after it is expelled from the bronchi. Nevertheless, Delamare [11] was able to conserve them alive in a Petri dish at the temperature of the laboratory from four to five days, and the spirochetes found by Lancereaux in the pleural effusion remained still alive in the extracted liquid after the sixth day. The parasite is polymorph in character and varies in length, shape and number of the spirals in every individual organism. Castellani and Chalmers described four principal varieties. The length is between 2 and 32 microns, the greater number between 5 and 15, and the width is between 0.2 and 0.6 micron. The shape varies between a thick and very thin individual, the extremities of which are either thick, thin or tapering. The thick organisms are characterized by being more or less long with few spirals and by their small numbers in the microscopical field. The thin or medium ones with many and close spirals are more numerous. Fantham considers the medium-sized organisms as being transverse partitions of long ones. He also described within the body organism the formation of intracellular granules which he called "coccoid bodies," and according to him these granules are the spores of the parasite through which contagion is carried, and the species perpetuated. Laveran and Mesnil described similar bodies in spirochetes found in oysters. These bodies are set free by the breaking of the periplasm of the body cell, but do not seem to be the only means of reproduction of the parasite, as Fantham and Galli-Valerio described transverse and longitudinal divisions.

Castellani's spirocheta resembles very closely the buccal and dental varieties found in the normal state in the mouth cavity and should be well differentiated from them. These, as was first pointed out by Chalmers and O'Farrell, then later by Taylor, are characterized by being less active and live longer outside the human mouth. They stain more easily and do not possess an intracellular stage, as the formation of coccoid bodies is rather a property of the bronchial type. It has also to be differentiated from *Spirocheta vincenti*, which is considered by Rothwell, Sabrazès, Delamare, Chamberlain, Grimaud, &c., as the same organism; and, according to them, infection with *Spirocheta vincenti* may also localize itself in the bronchi and lungs instead of only in the tonsils; so Rothwell published his observations under the title of "Bronchial Vincent's Angina," whilst the mouth and pharynx were not affected. As a matter of fact, so far one cannot admit the analogy of these two micro-organisms, as they both, as far as clinical considerations are concerned, occasion dissimilar symptomatology and lesions which present pathological differences. It has also to be differentiated from *Treponema pallidum* in syphilis of the respiratory organs, and from *Spirocheta ictero-hæmorrhagica* first found by Garnier and Saporés [12] in pulmonary spirochetosis ictero-hæmorrhagica.

Many stains are used for colouring Castellani's spirocheta. The best, which puts it more in evidence and in greater numbers, is the Fontana-Tribondeau. It colours it black, but has the disadvantage of

rendering the other histological elements of the specimen indistinct, and thus the examination of the specimen cytologically becomes impracticable. Sabrazès recommends a stain consisting of: Blue of teluidin one part, alcohol 95° fifteen parts, phenol three parts, and distilled water q.s. add 100 parts. The specimen before colouration must be very thinly spread and dried without fixation. Other stains are: Methylene blue, crystal violet, phenicized thionin, Ziehl, hæmatoxylin, Giemsa, Leishman, Romanowsky, &c. Delamare claims that the filiform types are rendered visible only by submitting the preparation to the tanning action of tannin, and then coloured with fuchsin.

Castellani's spirocheta cannot yet be cultivated. However, Noguchi's nutrient medium for the cultivation of *Spirocheta ictero-hæmorrhagica* may be tried, and the expectoration should be very carefully collected in sterile Petri dishes after thorough washing of the patient's mouth, as according to Noguchi [44], the presence in this nutrient medium of other micro-organisms such as diplococci, streptococci, pneumococci, &c., which may be conjoined with the *Spirocheta bronchialis*, would hinder its cultivation.

Inoculations of various animals have so far remained negative. Chalmers and O'Farrell, however, in 1913, were able to communicate the disease to monkeys by intratracheal inoculation after chilling the animals. The writer, with Crendropoule and many others, tried inoculations on rabbits, guinea-pigs, &c., and so far the experiments have been unsuccessful. Subcutaneous inoculations were accompanied by inflammatory swellings which never contained any spirocheta. Barbary described a congestive state in guinea-pigs with hæmorrhages after inoculation, but spirochetes were never found in any of the organs. Delamare experimented on hens, Courcoux and Debré inoculated the anterior eye chamber of a rabbit with a specimen containing very numerous spirochetes, and this latter inoculation provoked an irido-cyclitis, but they were unable to detect in the eye any spirochetes. All experimenters have so far been disappointed continually, except on monkeys by Chalmers and O'Farrell, and if the animal experimented upon died from the experiment it was either due to intoxication or infection caused by other pathogenic germs found conjointly with the spirocheta. It would be interesting to state here that Mendelson [45], in Siam, described a form of broncho-pulmonary spirochetosis in cats.

The cytological examination of the expectoration offers no special characteristic appearances. It presents the usual elements of the sputum, viz., epithelial and bronchial cells, leucocytes and also blood corpuscles which may be numerous, depending upon the presence or absence of hæmoptysis.

The blood count of patients affected with broncho-spirochetosis, except for a slight eosinophilia in some cases, may present slight anæmia.

SYMPTOMATOLOGY.

Broncho-spirochetosis is a disease principally attacking adults and is characterized by cough

accompanied or not by hæmoptysis and is often taken for phthisis. Different varieties are known. The ordinary type may be acute, subacute, or chronic. Other forms are: Pneumonic and broncho-pneumonic, asthmatic, pleuritic, gangrenous and associate.

Ordinary Acute Variety.—In this form the disease usually takes the aspect of acute bronchitis, and in fact it is often taken, as Castellani remarked, for influenza. In the epidemic of 1917-18, many cases of the disease were taken for grippé, and at one moment influenza itself was considered, by certain authorities, of spirochaetic origin. De Verbizier [46], Weil, Loygue, Bonnet and Peyre, &c., found numerous spirochaetes in the expectoration of patients affected from so-called influenza, and it was a question whether these organisms were of any causal factor.

The patient is suddenly taken ill with chill, fever and cough. His general health is usually disturbed and he may complain of headache and general rheumatoid pain all over the body. Coryza may be present at the onset, and it may be that the infection first localizes itself in the nose and naso-pharynx, and from there it invades the broncho-pulmonary system. Respiration is often more or less difficult, and the patient may complain of oppression. Fever may be high and usually it does not last more than one week. Cough may be slight, moderate, severe, accompanied by either dry, scanty, moderate or abundant mucous or mucopurulent secretion, and may take the character of fits. Hæmoptysis or sputum streaked with blood may occur. The patient usually recovers, but often passes into the subacute or chronic variety. In one case, the disease declared itself abruptly with chill, fever, and symptoms of acute bronchitis, with headache and general pains followed by marked debility and impotency for five months and by a chronic cough with expectoration frequently streaked with blood and now and then a crisis of hæmoptysis. In another, the patient, without any previous complaint, was taken suddenly ill with fever and a severe hæmoptysis amounting to about one glass and a half of blood, followed by another after a quiescent period of thirty-five days during which the patient scarcely coughed.

The physical examination may reveal nothing at all. Dry, moist and crepitant râles may be heard and patches of dullness may be present.

Subacute Variety.—This may either begin abruptly or more often insidiously. Its onset may be marked by hæmoptysis; usually there is no fever and if there is any, it is very slight. Cough is usually slight and on rising in the morning. The expectoration may be scanty and is rather pinkish, jelly-like or reddish mucopurulent. The patient may spit blood but very rarely and in small quantities. The case may run a mild course and terminate in a few weeks; but often it goes into the chronic state.

The physical signs of the chest may be altogether lacking, but patches of dullness, crepitant, dry and moist râles may however be detected.

Chronic Variety.—This variety is usually a continuation of the acute or subacute type, or may mark its course as chronic from the outset. All patients

practically express the sensation of some oppression in the chest. In one case the patient complained of a stabbing pain behind the sternum on deep inspiration and a sensation of cold over the left scapular region. Another felt a sensation of something glued behind the upper part of the sternum, especially on rising in the morning.

The cough begins either acutely or insidiously and varies in severity in different cases. Usually it is worse early morning, in the evening and at night than in the daytime, and may take the character of fits. In one case the cough abated in winter to reappear in summer; in another it was insignificant, and there was constant desire to clear the throat by hacking.

The expectoration varies in amount and character; with one it is scanty, with another moderate or abundant, viscid or mucopurulent, greenish, yellowish or often gooseberry in colour and frequently bloody or streaked with blood. Hæmoptysis may be very frequently repeated and may mark the onset of the disease.

The temperature is usually normal and sometimes little above normal. Hectic temperature, for a period of twenty days, was however recorded in one of my cases.

The course of the disease is protracted and may terminate favourably and is characterized by quiescent periods or apparent recovery alternating with so-called relapses. In one case (see fig. 2) a clerk aged 30 in 1911 whilst in Brazil, after a hard day's work, had hæmoptysis which continued for three days. He had never coughed before. Following that event up to 1917, viz., for six years, he was practically well: he only complained of an insignificant cough which he attributed to soreness of the throat, and now and then felt some oppression behind the sternum. On August 24, 1917, he woke in the night and coughed blood, which continued for some days. He consulted a physician who told him it was the first stage of consumption. On September 9, 1918, he had a third attack of hæmoptysis, and on May 6, 1919, a fourth attack. In the intervals between the second, third and fourth attacks he was practically well, and suffered of very scanty cough. The fourth crisis eventuated into chronic cough with mucopurulent pinkish expectoration, sometimes yellowish and greenish in character, and now and then had a crisis of hæmoptysis.

The physical examination in these chronic cases may present nothing particular. However, the mucous membrane of the fauces and pharynx is often covered with red follicles and sometimes spread over by patches of dirty yellowish or brownish adherent mucus. This is suggestive that the spirochæta also attacks the throat, and the writer has been able to detect it in throat smears. The chest, on the other hand, may present signs of bronchitis with varying râles. Signs of infiltration and consolidation may frequently be detected.

X-RAY FINDINGS.

The writer has been recently and regularly conducting in his own laboratory X-ray examinations of

patients with Castellani's broncho-spirochaetosis. The cases so far examined are subacute and chronic. Mild cases present nothing particular, as in this type the inflammatory process is very slight and does not seem to extend beyond the mucous membrane of the upper air passages, so that the transparency of the lungs is not disturbed. In other cases, where the inflammatory condition is deeper, varying zones of loss of transparency in one or both lungs are detected, more particularly around the root regions (see fig. 1).

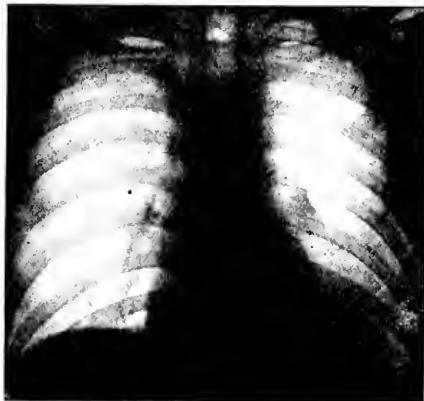


FIG. 1.—A case of eighteen months' duration.

The apices of the lungs may present differences of transparency, but seem to be more or less unaffected. In very chronic conditions zones of sclerosis may often be associated (see fig. 2). Cavity formation is not at

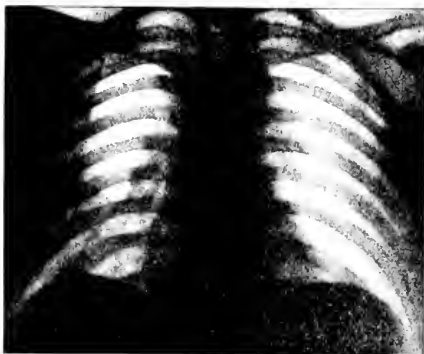


FIG. 2.—A case of eight years' duration.

all met with unless the case is associated with phthisis, and then it would be due to the tubercular process. The movements of the diaphragm may be

more or less limited, especially when the pleura and the basis are involved. In brief, one frequently encounters varying areas of varying opacity around the root region of the lungs, and in very chronic conditions these extend towards the basis, whilst the transparency of the apices is less often disturbed.

Radiographically speaking, the condition might as well be taken for phthisis, as these signs are also met with in the latter disease. Consequently, a close bacteriological study of the expectoration becomes in fact imperative to establish the real nature of the illness.

BRONCHO-PNEUMONIC AND PNEUMONIC VARIETIES.

Taylor, Macfie, Grimault, &c., have been able to report cases with pneumonic symptoms, and these were practically of slow evolution, mostly occurring in patients who already were suffering from cough. However, Macfie and Grimault have each observed one case only of genuine pneumonia with expectoration containing numerous Castellani's spirochaetæ. The patient, the writer observed, was a robust man, aged 23, who had been in perfect health before he fell ill. He was suddenly taken ill with a chill, followed by high temperature of 40.5°C ., and a few hours later he coughed up enormous quantities of blood, which was very difficult to stop. The writer saw him on the third day of his illness, and found his clothes and bed covered with blood, as every motion of his provoked hæmoptysis, and thus he could not have his clothes and bed sheetings changed, but was obliged to be kept in an absolute motionless decubitus. His temperature was 40.3°C ., and he presented signs of hepatization all over the upper part of the left lung, and moist râles all over the right one. The general state was very bad, and two physicians who had already examined the case before the writer diagnosed galloping phthisis. Examination of the expectoration, however, on repeated occasions, proved total absence of tubercle bacilli, and the animal inoculation for tuberculosis was altogether negative. There was also total absence of pneumococci and other pathogenic germs, except spirochaetæ, which were found in abundance, and literally covered the microscopical field. The temperature kept very high, oscillating between 39.5°C . and 40.8°C . (see fig. 3), and the

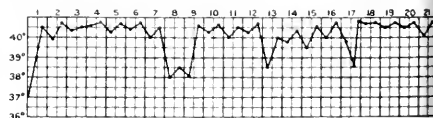


FIG. 3. Temperature chart, pneumonic case.

patient coughed and expectorated bloody sputum. On the eighth day of the illness he perspired profusely in the morning, and the temperature fell down by pseudo-crisis to 38°C . The signs of hepatization were clearing away, and only moist râles were heard extensively over both lungs. The next day, in the evening, the patient again felt chilly, and his temperature rose to 40.6°C .

This was followed by a crisis of hæmoptysis less severe than the previous, probably owing to the fact that the patient was constantly kept under hæmostatics. Signs of hepatization were again detected, and this time over the left base, and moist râles covered all the chest wall as to obscure even the heart sounds. On the thirteenth day the temperature fell down again about noon to 38.5°C , and the patient perspired. On the evening of the same day he again felt a chill, and the temperature marked 40°C , and he coughed up blood. The right lung was then affected, and signs of consolidation were detected over the upper part, while moist râles were constantly heard all over both lungs. On the seventeenth day the temperature fell down in the afternoon to 38.6°C , and the patient again perspired very little. Few hours later the temperature rose as high as 40.8°C , and the patient spat up again enormous quantities of blood, in spite of the internal use of calcium chloride and injections of gelatine and horse serum. Both lungs were then severely attacked, and signs of hepatization covered practically all of the right lung. On the twenty-first day the patient died of exhaustion, and no post-mortem examination was allowed.

During the course of the illness urine analysis revealed only traces of albumin and great quantities of urobilin; Wassermann reaction was negative. It is to be remarked again that on no occasion tubercle bacilli, pneumococci, or any other pathogenic germ could be detected in the expectoration beside Castellani's spirochæta, which was present in large numbers.

PLEURITIC VARIETIES.

Simon and Raditsch observed a case with chronic cough and signs of pleurisy with effusion, and found Castellani's spirochætes in great number in the expectoration (*Bulletin de la Société Médicale de Nancy*, tome v, No. I, premier janvier, 1919). The writer had the occasion to observe a similar case with signs of dry pleurisy, whose expectoration contained also numerous spirochætes, and Manine [27] made the same observations. In all of these cases the pleura seemed to be invaded through the lungs. On the other hand, Lancereaux met with a case of pleurisy where he found spirochætes in the pleural effusion drawn out by thoracentesis.

ASTHMATIC VARIETY.

Only a brief description will now be given of this variety, as the writer intends to treat this subject in extenso in a separate paper later on.

So far, four cases in all have been observed. In one, the patient was already suffering of chronic cough, which came on insidiously, followed by occasional attacks of asthma, which were either brief, moderate, or strong. In two cases the disease began abruptly with high temperature and cough, and the patients were treated for influenza. In both this condition eventuated into a chronic cough, followed at times by a paroxysm of asthma. The fourth case is that of an unmarried woman, aged 40, who has been suffering for the last four years of asthma, attacking

her once only every year between the months of September and November, and these attacks were of long and continued duration.

In all these cases the asthmatic paroxysm did not differ from the usual bronchial type with all its physical signs. The expectoration before and after the paroxysm—except in the fourth, when it occurs after the paroxysm—contained numerous spirochætes, which were more abundant after the crisis. Leyden-Charcot's crystals and Curschmann's spirals were absent whereas eosinophilous cells were found.

X-ray findings did not differ in character from those of the chronic variety.

FÆTID AND GANGRENOUS VARIETIES.

Fætid types of broncho-spirochætosis were observed by Beau, Dide and Ribereau in June, 1918, in the French Army, and the fætidity of the expectoration was quite characteristic. The patient is usually taken suddenly ill with temperature which may attain 40°C , and expectorates fætid sputum, at times bloody in character. As a rule the case terminates favourably within a week. Some cases present relapses but the disease does not last more than one month.

Gangrenous cases have on the other hand been observed by Mühlens, Küster, Paraf, Ghôn, Wester, Chamberlain, Weil, &c., but in all these cases, as well as in some of the fætid bronchial types, spirochætes were found in association with Vincent's bacillus. It is, however, questionable whether the spirochæta met with in these cases is Castellani's.

ASSOCIATE VARIETY.

Broncho-spirochætosis may be found associated with other pulmonary diseases, such as phthisis, bronchomycosis, &c., and may complicate diseases such as typhoid fever, malaria, mumps, &c. According to some authorities, the hæmoptoe condition in phthisis is principally due to the action of Castellani's spirochæte.

MODE OF INFECTION.

Nothing sure is yet known with regard to the mode of transmission of broncho-spirochætosis. Certain authorities claim that it is very contagious, and according to Fantham, the infection is carried from diseased to healthy persons by the "coccoid bodies" of the spirochæta spread out in the air by coughing or from dried sputum.

From the cases the writer has so far observed, he concludes that the disease is not so contagious as is supposed to be the case, and there seems to exist another way of transmission, as none of his patients communicated the illness to any of his own people who lived with him and were naturally particularly exposed to the contagion. This may well be illustrated by one of his patients who suffered for eight years from the disease, and for four years slept in the same room with his brother; neither his brother nor anyone else in the family contracted it. Also, in another case, the patient suffered for four years and his wife did not get infected. Therefore, the question

of the transmission of the disease needs yet to be reviewed and thoroughly investigated.

With regard to the development of the infection, Violle and others—and the writer concurs in their opinion—suggest that as the *Spirochæta bronchialis* is not infrequently found in small numbers in the mouths of healthy persons—as is often the case with the pneumococcus—any impairment in the vitality of the resisting powers of the organism, or any excitation in the virulence of the parasite, may cause the spirochæta to penetrate into the whole of the broncho-pulmonary system and there settle and proliferate, giving rise to the disease.

Whether broncho-spirochætosis has always existed in Asiatic countries, where it is considered prevalent, and from there carried over to other countries, needs yet to be proved. The writer believes that it is a world-wide disease; nevertheless it is more prevalent in tropical countries where its frequency is probably favoured by the existing climatic conditions. Thanks to Castellani, the discoverer of the affection in Ceylon, who first drew the attention of investigators to it, the disease has now been universally found to exist in other countries as well as in Asia, and in patients who had never been in Asiatic or tropical countries or come in contact with people coming from the latter regions.

DIAGNOSIS.

The chief difficulties encountered in diagnosing broncho-spirochætosis are due to the fact that clinically the disease closely resembles other pulmonary affections with exactly similar symptoms and physical signs, and is consequently taken for the one or the other. Therefore, the only means of establishing the true nature of the illness depends upon a close bacteriological study of the patient's expectoration, and it follows that attention must from the start be principally directed to it, as the diagnosis is based upon the constant presence in the sputum of numerous spirochætes and the absence of any other pathogenic germ.

The disease which comes first on the list of these affections simulating broncho-spirochætosis, and is very often mistaken for it, especially when the patient expectorates blood, is phthisis. As a matter of fact, the symptoms in both diseases may be so alike—except in cases of advanced phthisis—that it is often practically impossible to discriminate the one from the other clinically. In both—though in phthisis there is a more clear tuberculous history and the signs are more evident—patches of dullness, dry, moist and crepitant râles may be detected accompanied by subacute fever and a debilitated condition. X-ray examination may also be so doubtful that without an examination of the patient's expectoration—and if needed the different tuberculin reactions and animal inoculations—the diagnosis of the case remains uncertain. On the other hand the disease may often co-exist together with phthisis as well as with other pulmonary affections such as broncho-mycosis, &c.

Influenza should be distinguished from the acute variety of broncho-spirochætosis, as in the former

disease the absence from the expectoration of Castellani's spirochæta and the presence of Pfeiffer's bacillus (?) decide its true nature. Malaria is differentiated by the presence of the *Plasmodium malarie* in the patient's blood.

Ordinary bronchitis, broncho-pneumonia, pneumonia, broncho-mycosis, endemic hæmoptysis, Vincent's angina, with or without pulmonary extension, depend for diagnosis chiefly upon the presence in the expectoration of only such pathogenic germs as: streptococci, pneumococci, Friedländer bacilli, fungi, ova of *Paragonimus westermani* and Vincent's *Bacillus fusiformis*.

Pulmonary spirochætosis ictero-hæmorrhagic is distinguished principally by the appearance of icterus later during the course of the illness, which coincides with the disappearance of the *Spirochæta ictero-hæmorrhagica* from the expectoration, besides the bacteriological differences existing between the two parasites.

Syphilis of the respiratory organs is differentiated by a clear history of syphilis and a positive Wassermann reaction.

Bronchiectasis is usually unilateral and presents more characteristic physical signs. The same holds true in abscess of the lung.

In asthma, fœtid bronchitis and pulmonary gangrene of spirochætic origin, the only evident proof of their spirochætic nature is the finding in the expectoration of Castellani's spirochæta in large numbers.

The affection should also be discriminated from simple bleeding of the nose, naso-pharynx or mouth, and from such conditions observed by the writer and Crendiropoulos in which patients presented exactly similar symptoms of coughing with hæmoptysis and which was most probably due to a streptobacillus found in great numbers in the expectoration of such patients.

Heart and kidney diseases may give rise to cough and hæmoptysis, but are very easily differentiated by their respective signs. However, broncho-spirochætosis may not unfrequently complicate these conditions.

Last, but not least, X-ray examination should if possible be conducted in every case examined as it is a very valuable means of diagnosis, whilst alone it cannot be sufficient to establish the real nature of the illness, without being associated with a bacteriological examination. It rather shows to what extent the pulmonary organs are affected.

PROGNOSIS.

The prognosis, *quoad vitam*, is favourable as far as the ordinary types are concerned, but may prove fatal in the more severe forms.

From the point of view of evolution, the disease tends to become chronic and may follow an exceedingly protracted course lasting for years. Cases apparently cured often have relapses, and that may be weeks, months and even years later, as in one case observed by the writer. The danger of such a long-standing course must be borne in mind as it exposes

the patient to the late development of certain complications and sequelæ, such as emphysema, phthisis, &c. The occurrence of hæmoptysis is very rarely fatal in itself, but may weaken the patient and render the lung tissue susceptible to tuberculous infection.

In pneumonic and broncho-pneumonic types, the disease is often not of a serious importance, but on the other hand it may prove to be dangerously fatal to life depending upon the severity of the involvement of the respiratory organs. The fætid types very often recover whilst the gangrenous are always very grave and almost always fatal.

TREATMENT.

The treatment of broncho-spirochaetosis involves hygienic and medicinal measures.

Besides the prophylactic measures the hygienic treatment comprises also all that pertains to the patient's protection from various injurious influences, as the disease has a tendency to follow a chronic course and secondary conditions such as phthisis may develop. Thus the patient should be advised not to spit on the ground but in suitable sputum cups which are disinfected afterwards so that the disease may be prevented from dissemination. He must also avoid catching cold and be protected from atmospheric variations, but allowed to stay very often out of doors whenever the weather is pleasant, and, if possible, to sojourn in a suitable climate. He should also avoid physical fatigue and not allowed to smoke or breathe dusty and unhealthy air of public or confined places. If fever is present he should be kept in bed until it disappears and the room kept well ventilated. His diet must be in general wholesome, nourishing and generous, and alcohol prohibited.

The medicinal measures are palliative and curative.

The palliative treatment is the same as that prescribed in bronchitis, bronchial asthma, broncho-pneumonia, hæmoptysis, &c., according to the variety of the disease, and to avoid repetition the reader is referred to the chapters of treatment of these affections in ordinary text-books. Tonics, especially glycerophosphates and hypophosphates, are often administered to keep up the vital powers of the patient.

The curative treatment consists in administering such drugs as are capable of killing the parasite and adding the patient from the malady. Castellani first recommended arsenic or tartar emetic given separately or combined together. He uses arsenic either internally in the form of Liquor Fowler and pills of arsenious acid or hypodermically in the form of acedylates. Occasionally when the cough is dry, he prescribes potassium iodide. He recommends the following two formulæ with good results:—

Tartar emetic	...	...	$\frac{1}{2}$ to $\frac{3}{4}$ gr.
Liquor arsenicalis	...	...	2 to 3 minims
Cocaine	...	...	$\frac{1}{2}$ gr.
Glycerine	...	...	1 drachm
Syrup tolu	...	...	1 "
Aque chloroformi	...	...	1 oz.

One ounce to be taken three times a day, well diluted.

Or

Tartar emetic	...	...	$\frac{1}{2}$ to $\frac{3}{4}$ gr.
Potassium iodide	...	...	5 gr.
Bicarbonate of sodium	...	...	10 "
Glycerine	...	...	1 drachm
Syrup tolu	...	...	1 "
Aque chloroformi	...	...	1 oz.

One ounce to be taken three times a day, well diluted.

On the other hand, Plaut, Galli-Valerio and others recommend salvarsan, neosalvarsan, galy, atoxyl, &c. All these arsenical compounds have as well been tried in the more severe types of the disease and have been claimed to give often beneficial results.

The writer had frequently used neosalvarsan intravenously with practically very little benefit, and spirochaetes continued to be present in the expectoration. He then treated his cases—the subacute and chronic—with intramuscular injections of iodine preparations with very satisfactory results. His treatment was based on the fact that fowls which had already been injected with iodine did not contract fowls' spirochaetosis when they were pricked by the argas, carrier of the disease.

The preparation frequently used by the writer is lipiodol analogous to iodopine, containing 54 per cent. of iodine in poppy oil. The injection is slightly or not painful. He gives a course of three to six injections of 2 c.c. each, one injection daily followed by twelve to twenty-four more injections on alternate days or every third day according to the tenacity of the case and the tolerance of the patient. The injections are made intramuscularly in the gluteal regions, and except for a sensation of dryness in the throat and nose in few of the cases, in no patient did symptoms of iodism appear. However, an abundant expectoration usually occurs at the beginning of the treatment followed by a distinct amelioration in the patients' symptoms. Cases with hæmoptysis were given calcium chloride internally as well as the same series of injections.

The sputum in every case was regularly examined after the third or sixth injection. The spirochaetes were found to be very greatly decreased in numbers as compared with their enormous number prior to the treatment; and at the end of the course of injections, they nearly disappeared and there was scarcely any sputum.

One series of injections is usually sufficient, but this may have again to be repeated some two weeks later, or instead the patient may be advised to take internally iodotannic syrup from a teaspoonful to a tablespoonful three times daily, for a period of fifteen days, to be followed by a second, third, fourth, with a week's rest between one period and the other. This way of administration is considered as a precautionary measure to make sure that the spirochaeta is killed.

Practically all of the writer's patients thus treated recovered, as demonstrated by the great improvement in their general condition and the disappearance of the cough. As regards the asthmatic variety, two patients are now apparently cured, as the cough and the paroxysms of asthma have

altogether stopped; the two other cases have greatly ameliorated but still have occasionally asthmatic attacks, though less frequently in spite of the disappearance of the spirochæta from the expectoration.

Special attention has also to be given to the nose, mouth and throat of every patient. The throat is regularly brushed every third or fifth day with one part each of pure iodine and potassium iodide in thirty parts of glycerine. Tonics such as Fellows' syrup have often been given.

Whether Castellani's spirochæta is killed *in situ* by an antiparasitic action of the iodine circulating in the blood and eliminated through the broncho-pulmonary system, or by the iodine stimulating the defensive power of the tissues against the infection, remains yet to be proved. Most probably, however, the improvement is principally due to the antiparasitic action of the iodine on the spirochæta itself.

In my opinion it is quite possible that the beneficial result often attributed to potassium iodide in cases of chronic cough and bronchial asthma may be most probably due to the fact that many of these cases are of spirochætic or mycotic origin.

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NERVOUS SEQUELÆ OF PHLEBOTOMOUS FEVER.

By I. H. LLOYD, M.B., B.S.Lond.

AS is generally accepted, the febrile state of phlebotomous fever or sand-fly fever lasts from three to four days, the temperature having usually completely subsided within the week.

The symptoms to which I desire to invite particular attention are those which follow on this stage, and are of a distinctly nervous origin, lasting from fourteen to twenty-one days. The prodrome of this particular post-febrile stage primarily reveals itself by evenin

headaches, which conduces to insomnia; the patient enters upon a state of mental depression and moroseness, clinically manifested by impairment of the faculties of attention and concentration, irritability of temper, a desire for diurnal sleep which results only in interrupted periods of slight unconsciousness. When awake, the mental attitude is one of listlessness and a desire to mope. Any attempt to engage in conversation results only in a relapse into indifference on the part of the patient. Concurrently with these mental symptoms there are generally complaints of vague aching pains and weakness in the back, which last from fourteen to twenty-one days. Anorexia is a noticeable feature. There are fine tremors of the eyelids and hands; the reflexes are sluggish and pulse is usually slow. To illustrate in what a pronounced way these nervous phenomena beset some patients, I may here mention that I had a case of veronal poisoning during this period of nervous debility. The patient associating his general discomfort with insomnia, took small doses of veronal, and, obtaining no relief, gradually increased the dose at bedtime until a poisonous dose was reached.

I know of another bad case of psychasthenia in a lady doctor following phlebotomous fever.

It was uniformly observed that patients whose usual deportment previous to the attack of fever was of the brightest and most genial, lapsed into apathy and apprehension, associated with the symptoms above described.

The most satisfactory treatment was found in the early administration of preparations of opium, and it was thought that the administration of this narcotic might possibly account for this peculiar and protracted nervous debility. On the contrary, however, it was observed that those patients who had been treated by other remedies, e.g., quinine and the coal tar group of analgesics, displayed precisely the same nervous symptoms, perhaps a little more pronounced than those who had been treated with opium.

It is recognized that toxins which can induce a febrile reaction even for so short a period as three to four days, do produce a debilitant reaction on the constitution, having concomitant nervous manifestations, but the nervous asthenia which I have described above was so predominant and lasting in its regularity that one was led to suspect that the toxins of the *Anopheles phlebotomi* had a selective action upon the nervous mechanism.

On the above hypothesis, it can be appreciated that the greater the neurotic element in a patient, the more marked become his symptoms. Moreover, as one attack of phlebotomous fever did not confer immunity, a succession of attacks—and such cases were frequent—each occurring de novo, superabundantly accentuated an already existing attack of neurosis.

It is generally taught that phlebotomous fever leaves no complications or after-effects. I am, on the contrary, inclined to the belief that phlebotomous fever can act as an aggressive factor in an established neurosis, and can precipitate a latent neurosis in an inherent subject—and can moreover induce *per se* neurasthenia of varying degree in all subjects.

PERSONAL EXPERIENCES OF BILHARZIA DISEASE.

By F. G. CAWSTON, M.D. Cantab.

Natal.

THE progress of those cases of bilharzia disease which have undergone a complete month's treatment with tartar emetic intravenously or emetine intramuscularly leaves me in no doubt that either of these methods of treatment do successfully eradicate the parasites; but the recurrence of ova in the urine of patients, who have remained free from symptoms or signs of the disease for several months but have re-exposed themselves to fresh infection, indicates that no permanent immunity is established by these methods of treatment.

Some patients with a high eosinophilia count and a relatively slight affection respond to a relatively short treatment. However, to make sure of success, it is best to prolong the course of injections for a complete month and, as in hydatid disease, wait for from six weeks to three months before forming any opinion that the cure is a complete one; though some guide as to success may be obtained from the eosinophilia count after treatment is discontinued.

The following notes on a case of auto-infection are instructive and form an interesting item in the life of a research worker. On February 3 and 18, and again on March 30, I collected *physopses* from along the banks of infested pools. On April 6 and 25 I examined some *physopses* which I had experimentally infested with the bilharzia parasite. On April 16 I did 100 yards' sprint on the beach after a bathe, but took to bed the next day with a temperature of 101° F., which rose to 102° F. on each of the following evenings, and did not settle down to normal until April 23. There were no symptoms other than the feelings usually associated with a rise in temperature. After some exertion the temperature rose to 100° F. on April 30, otherwise I did fairly well. In this case infection must have taken place through my unprotected fingers while collecting the specimens or dissecting them.

On May 2 Dr. W. A. Murray kindly examined my blood, and reported an eosinophilia count of 39.5 per cent. On May 9 the clinical research laboratory reported an eosinophilia of 32 per cent. X-ray examination revealed a prolapsed colon and enlarged liver, which was also slightly swollen and tender. Occasionally there were slight stabbing pains in the precordial region, and there was some oppression on deep respiration. This condition suggested the migration of flukes; but it was decided not to commence active treatment until the cause of the condition was determined, though subsequent events would have justified it. Small doses of mist. alba were taken on waking in the morning, and careful watch was made of the motions and centrifugized deposit of the urine. It was not till December 27 that a few typical spine-pointed ova of *Schistosoma hematobium* with a few leucocytes and epithelial cells were detected in the urine, as well as oxalate crystals, which were constantly present during the following month.

No albumin and none of the usual signs of infection could be detected, other than those mentioned above.

With the kind assistance of a nurse who held the rolled-up shirt-sleeve as an improvised tourniquet, I injected $\frac{1}{2}$ gr. antimonium potassium tartrate, dissolved in 1 c.c. of tap water, at 11 a.m. on January 8, using a 3 c.c. all glass syringe fitted with a dental needle. At 3 p.m. about half a dozen ova were seen in the centrifugized urine, and half of these were degenerated. At 10 a.m. the following morning I injected $\frac{3}{4}$ gr. dissolved in $\frac{1}{2}$ c.c. At 4 p.m. one ovum was seen in the centrifugized deposit of urine. A full grain dissolved in 2 c.c. was injected into the same vein at the bend of the left elbow at 10 a.m. the following day, and one dead shrivelled ovum was the only one found at 4 p.m. The following day I took an iron and arsenic tonic to counteract some slight depression, and, at 10 a.m. on January 12, injected $1\frac{1}{2}$ gr. I had several patients to see shortly after the intravenous injection, and got wet in a heavy rain that evening; but I was able to rest in bed during the afternoon, as a sense of well-being after the first injections had given place to lassitude and breathlessness on exertion, with occasional gnawing pain in the precordial region, though the temperature remained normal and there was never any feeling of nausea.

As several instances are on record where a series of antimony injections were discontinued on account of an attack of "influenza," I was interested to experience nasopharyngeal discomfort, running from the nose, occipital headache, aching in the limbs, sexual apathy, temperature rising to $99\frac{1}{4}^{\circ}$ F., followed by general weakness, pulse settling down to 54 per minute, deafness particularly in the recumbent position, and tinnitus due rather to general exhaustion than to catarrh. This condition reminded me very forcibly of a "five days' cold," and, as I had not experienced one for over twelve months, it was almost certainly due to the drug. In severe cases of bilharzia disease, where there must be many dead and dying parasites within the portal system, toxic effects are uncommon.

On January 13 one blackened ovum and a macerated miracidium were noted in the centrifugized deposit of urine; on the 16th three dead ova; on the 17th one apparently normal and one dead ovum; on the 19th no ova; on the 20th and 22nd one black shell; on the 23rd, 25th, 27th and 29th no ova.

On June 8 the eosinophilia was 26 per cent., on July 26 it was 17.5 per cent., and on January 19 it was 15 per cent. In view of the loss of weight from a normal of 150 lb. to only 139 lb. and the continued eosinophilia, the injections have been discontinued, $\frac{1}{2}$ gr. being injected on the 26th, $\frac{3}{4}$ gr. on the 27th, and 1 gr. on the 29th without ill effect. Throughout the injections there has been no local reaction or any immediate toxic effect. In each case the injection was given whilst seated in a chair, but I arranged to lie down for a few minutes after it.

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QUEER FOODS.

AN article entitled "The Queerest Foods in the World," by Mr. Bassett Digby, which appeared in the July number, 1922, of *Chambers's Journal*, is interesting reading and well worthy of attention and further investigation. We have, however, but a few

accounts of why these queer foods are eaten from a medical point of view. Some of these are as follows: Snails for consumption in Europe—the black garden snail has the preference. Lizards to cure cancer in Guatemala. Cockroaches are considered fattening by the Turkish women. Scarcity of food and famine find many customers for human beings, cats, dogs, rats, mice, monkeys—not chosen from taste; but horse flesh and frogs have of recent years come to be widely used. Certain foods are avoided for various reasons. The Somalis refuse to eat birds of any kind and birds without a crop, as the woodcock, are cast aside by others.

To those who have not travelled far from their "homeland" an account of the dietary of different people is apt to engender resentment for having presented so unsavoury a tale, and will, in all probability, cause the reader to throw aside the record in disgust.

The dainty food of one race may be considered by another with loathing and avoided as unwholesome and abhorrent, and people of the same race or of the same family even differ in their tastes. Eels, for instance, are eaten with liking by some of the members of one family; the husband may relish them whereas the wife cannot even sit at the same table whilst other members of the family are eating them with avidity. The French, for instance, have frogs served at table as an ordinary dish, whilst in Britain but few people can tolerate the idea of consuming them. The woodcock, a favourite *bonne bouche* in Britain, is avoided by Scandinavians as unwholesome, the reason assigned being that this bird has no crop. The haggis is looked upon with abhorrence in England, whereas in Scotland, and more especially with Scottish folk away from their own native country, it is regarded as a great dainty, and it is sent from, say, Edinburgh to Hong Kong to be consumed at high festivals with avidity after travelling 10,000 miles. The Chinese are accredited with being foul eaters because they eat dried rats, salted puppies, and eggs a hundred years old; whilst they look upon us as barbarians because we eat salted butter, high game, and smelly cheese swarming with mites. We have many records of rats being eaten during famines, especially when cities have been blockaded, as evidenced at the siege of Kars and even in Paris in 1870. In Arctic expeditions also the ships' rats have been eaten as well as the mice. In China, however, casks of salted rats are sent by provision merchants all over China. Horse flesh is now a well established article of diet in many cities and in many countries, largely so in Europe.

Hedgehogs are not forgotten in England; they are avoured by gipsies. The writer at an "Odd Volumes" liner in Chelmsford some twenty years ago found the flesh pleasant, tender and tasty. Human flesh is still an article of diet and the Fiji Islands is one of the best-known localities in modern times. Children and young women are preferred to men's flesh.

Monkeys, pickled and roasted, it is said, by Mr. Digby, are eaten to-day by far more people than eat herrings, and resemble rabbits in consistence and appearance. When prepared for the table owing to

its resemblance to a dead baby most people insist that the monkey's head and hands shall be removed.

Lion in Central Africa is extensively eaten, and leopard is lauded in East Africa and Liberia; and tiger, jaguar, puma, alligator, and every sort of bird is eaten by many tribes of natives in many parts of the world, whereas in Somaliland the inhabitants will not eat birds. The Southern Chinese do not drink cow's milk. Bird's nest soup is the Chinese edition of turtle soup and sharks' fins resemble skate in the British dietary.

Religion determines diet, especially in India, where caste plays so prominent a part. Not even famine will bring them to touch animal food. Reptiles in Burma such as lizards are especially appreciated, and in the basin of the Amazon the South American Indian children are devoted to centipedes of a large size and eat them alive.

Snails, the black variety, found in our gardens are eaten in Europe, being recommended as a cure for consumption; one end of the snail is cut off by scissors, and the snail inverted by passing a threaded needle through it, when the inverted animal is filled with sugar and swallowed. The higher the standard of civilization the more restricted becomes the range of diet. A century or two ago in Britain many things were eaten which to-day are neglected. Beef is being set aside by many who on the strength of the fad call themselves vegetarians to the annoyance of their hosts and the assertion of their superior scientific mode of living. Some go a step farther and forego mutton, and several kinds of fish which are considered "vulgar fairin'." Some deny themselves sugar, some salt, until the limitations of their scale of diet is reduced to well nigh physiological starvation. Alcohol, in any and every form, as in the U.S.A., is at present under the misdirection of groups of faddists, mostly women, who, for want of something better to do, are depriving mankind of a large part of their "natural" beverages which distinguish them from animals, and are reducing the vigour of their white people to the level of tropical natives: and, if persisted in, the physical and mental status of their coloured citizens will gain the ascendancy.

In medicine the "physiological" doctor crank is playing up to the tomfoolery of his neighbours and he or she is selling himself or herself to "physco" this or that, in order to gain a livelihood, and smothering their better selves to the detriment of their souls and the ruin of their profession. Super-civilization has much to answer for, and it can only end in one way as it did in China some hundreds of years ago when military training was looked at askance and consigned the soldier to the lowest grade of society. Gradually is common sense, that is experience, returning to China, and the super-civilization will disappear and a natural and normal civilization return.

A scientific study of the different effects and the foods of mankind has not been attempted. The statement enumerative of a large number of them has been set out by Mr. Bassett Digby; it goes no farther than that certain animals are used as food, but there has been no analysis of the constituents of these

uncommon forms of flesh nor its effect upon the economy of the race. Whether a study of this branch of scientific inquiry will extend or narrow the present range of "queer foods" remains to be seen.

We laughed at the idea that the consumption of the flesh of the tiger gave to the man who ate it more the courage of the tiger; but thyroid gland for disease of the thyroid, the use of the "four glands" for glandular trouble, the ovary as a drug for ovarian trouble, and a host of other *materia medica* in the same direction make us think and we laugh no longer at the "old-fashioned fads." Mr. Digby has done a useful work in bringing these matters before us; it is to be hoped that he will go farther and stimulate others to set forth the effects on the physique, the health and the mental powers these "queer foods" have on the peoples and races who have adopted them.

The writer visited, with the late Major Robbins, R.A.M.C., the Chinese food market in 1894 in Hong Kong. The food exposed on the stalls and slabs consisted of materials which to British eyes seemed unwholesome, dirty, smelly, unedible, and contaminated. In our wanderings we strayed into the latrines in the market built by the Government and there found a very different state of affairs; the latrines were cleanly, no smell, and efficient. Major Robbins remarked here that the biblical saying that "It is not that which goeth into the mouth defileth a man, but . . ." is reversed. J. C.

Annotations.

Malaria of the Lowveld (H. A. Spence, *South African Journal*, January 13, 1923).—The cases of malaria on the Lowveld are deplorable, where protection against the disease is extremely rare. According to the author conditions now are no better than they were twenty years ago. The malaria is of the benign tertian type, and the symptoms are always severe.

Treatment of Arspheamin Dermatitis and certain other Metallic Poisonings (William L. McBride and Charles C. Dennie, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923).—Sodium thiosulphate given intravenously and by mouth rapidly shortens the course of arsenical dermatitis. It is a successful neutralizing agent for acute and chronic mercurial poisoning.

To secure the best results it must be given intravenously. In its pure form it is non-toxic up to 2 gm. doses. Certain conditions which impair the liver or kidneys are predisposing factors in the production of arspheamin dermatitis.

Certain warnings are often given which, if carefully observed and heeded, will prevent its appearance.

The Transmission of Plague by Fleas of the Genus Xenopsylla (L. Fabian Hirst, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—*Xenopsylla astia* and *X. cheopis* are the rat fleas of Colombo. The former greatly predominates. *X. cheopis* was not found till after plague broke out. Its distribution on the rats of the city is irregular, and is related to the distribution of rat and human plague. *X. astia* bites man reluctantly under tropical conditions.

Experiments carried out with *X. astia* and *X. cheopis* under parallel conditions show that *X. cheopis* is a much more efficient vector of plague than *X. astia*.

Bacillus pestis is capable of multiplying the stomach of *X. astia*, but this flea never behaved as a "blocked" flea in the course of the experiments.

Numerous attempts to transmit plague by means of *X. astia* from rat to rat, and from mouse to mouse, gave negative results during the plague season in Colombo.

Surveys of fleas of the genus *Xenopsylla*, occurring upon the rodents of districts liable to plague infection, promise to be of great practical value for forecasting the probable incidence of plague.

It seems probable that *X. cheopis* predominates on the rats of those parts of the East Indies liable to severe plague epidemics, and that *X. astia* is almost the sole rat flea relatively immune to plague.

The Germicidal Efficiency of Certain Antiveneereal Prophylactics (J. L. Priston, *Journal of the Royal Navy Medical Service*, vol. ix, No. 1, January, 1923).—Calomel cream is a weak disinfectant which fails to kill *Bacillus prodigiosus* in five minutes under conditions somewhat resembling those usually obtaining when it is applied for prophylaxis.

Calomel cream will inhibit the growth of organisms and will kill them after prolonged treatment.

The disinfectant action of calomel cream is due chiefly to the calomel and partly to the lanoline base.

Potassium permanganate 1 in 2,000 is too weak to kill *B. prodigiosus* under similar conditions. It is so weak and so easily decomposed as to be very unsatisfactory as a prophylactic.

Ordinary hard and soft soaps have a negligible disinfectant action, although, possibly, they remove organisms mechanically.

A certain proprietary mercuric iodide soap is theoretically a far better prophylactic than any of the above, combining all the advantages of a soap with powerful disinfectant properties.

On Fish and Mosquitoes in Palestine (P. A. Buxton, *Bull. Ent. Res.*, London, August 2, 1922).—Owing to the inadequacy of the financial resources of Palestine, the drainage of certain large

areas of marsh and swamp cannot at present be attempted. The results of a study of the native fish in this connection are discouraging, though interesting. The contents of the gut of *Mugil* sp., *Tilapia zillii*, and *Cyprinodon* sp. were examined, but no *Culicidæ* larvæ were found in the dissected fish. *Cyprinodon* appears to be almost omnivorous, and this and its variety of methods of taking food are points in its favour, as they probably enable it to exist, in spite of changing conditions; it is also apparently resistant to considerable changes in salinity.

Field observations have been more encouraging. Although *Aedes caspius* was found breeding in profusion in isolated cattle footprints near a marsh, where these were connected with the main body of the marsh water, no larvæ were found, the abundance of *Cyprinodon calaritanus* and *Tilapia zillii* in all shallow places seems to account for the absence of the larvæ from the shallows of the marsh itself. The larvæ of *Culex perexiguus* were also confined to small collections of water to which fish had no access, but *Culicine* larvæ were never found in the large bodies of water, although larvæ of *Anopheles hyrcanus* were numerous in patches of green algae that appeared to protect them from *Cyprinodon*.

Reduction of Amino Acids into Simpler Natural Bases (Amines) by the Bacillus dysenteriae (Shiga) (H. W. Acton and R. N. Chopra, and T. C. Boyd, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—Shiga's bacillus of dysentery, in a culture rich in amino-acids (veal broth), is capable of forming a substance which causes a marked contraction of isolated guinea-pig's uterus. Flexner and Y bacillus in the same media practically produce none of this substance.

In a broth poor in amino-acids (fresh broth), Shiga's bacillus forms little or none of this substance.

The chemical compound produced by Shiga's bacillus in veal broth is themostable, dialysable through a collodion membrane, and not neutralized by the polyvalent anti-dysenteric serum, showing that its molecule is smaller than that of proteids.

It is precipitated by phosphotungstic acid, a reagent commonly used for the preparation of amines. In acid solutions it is active, in alkaline solutions it is inert, a chemical behaviour corresponding closely to many other of the simpler bases. The solubility in water and not in CHCl_3 , benzene, &c., distinguishes it from alkaloids, as the latter are common solvents for these plant poisons.

The body is probably an amine; this is confirmed by the fact that it gives all the alkaloid tests, and the diazo reaction in addition, and, moreover, forms platinum salts and picrolates like many other amines.

As it is non-volatile, it belongs to the class of non-volatile amines.

The production of these poisonous bases (amines) by organisms such as Shiga's bacillus, cholera vibrio, &c., opens up a new field of investigation into the nature of bacterial toxins which have hitherto been regarded as proteids in nature.

The differences in the amount of amine produced in Shiga's bacillus, when acting on media poor or rich in the corresponding amino-acids, suggests the possibility that the same effect may take place in the human body, and so explain the difference in the intensity of symptoms between one case and another.

The symptoms of collapse, fall of blood-pressure due to increased permeability of the endothelium, vaso-dilatation, &c., are common effects produced by these poisonous bases.

Determination of the Specific Preventive Immune Bodies produced in the Blood as a Result of Preventive Typhoid and Paratyphoid B Inoculations (Bunshiro Tanabe, *The Military Surgeon*, vol. lii, No. 1, January, 1923).—Some normal blood sera of human beings possessed a bactericidal property to protect guinea-pigs from death against a lethal dose of typhoid and paratyphoid B bacilli in 0.5 c.c. Others needed more than 0.5 c.c.

The normal sera agglutinated both typhoid bacillus and paratyphoid B bacillus in most cases in dilutions as strong as 1:10 to 1:20.

By three consecutive inoculations with 3.55 mg. in total of each of both *Bacilli typhi* and *paratyphi B*, the protective effect of the serum became in most cases 400 times greater than that of the normal serum. But it must be noticed that some persons could not get such a high degree of immunity. The protective substances in their sera remained in a lower concentration, though the inoculation had been repeated.

The ratio of the amount of the normal agglutinins to that of the increased agglutinins in the serum after the three consecutive vaccinations was 1:20 to 1:40.

The serum drawn on the seventh day after the second inoculation contained already a tolerable amount of the protective antibodies.

The protective value of the serum is considerably decreased one year after the inoculations, but it is yet about five times greater than that of the normal serum.

The reinoculations produce much more of the protective substances in the blood than the first inoculations. In other words, the vaccine stimulates the production of the protective antibodies. This relation is readily recognized when the results of the inoculations of the recruits are compared with those of the trained soldiers.

The protective effect of the vaccinations against paratyphoid B infections is a little less than against typhoid infection. But of course it must be taken into consideration that the lower animals, such as

guinea-pigs, are more susceptible to paratyphoid than to typhoid culture when such animals are used as indicators of the effect of the inoculations.

The clinical effect of the prophylactic vaccinations has been statistically indicated by the very low incidence of typhoid and paratyphoid fever among individuals protected in this manner. The best results have been obtained in the American Army and the Japanese Army.

Abstracts and Preprints.

RESULTS OF SOME EXPERIMENTS IN THE TREATMENT OF MALARIA WITH ALKALI COMBINED WITH QUININE.¹

By Major J. A. SEXTON.

A FEW years ago Cowie and Calhoun (1919), and later Abrami and Senevet (1919), advanced the theory that the malarial paroxysm was of the nature of an "anaphylactoid" phenomenon, from the similarity of the paroxysm to that seen in "protein shock."

On this hypothesis, and because of many other factors of similarity between these two phenomena, it seemed to me that if the symptoms of the latter are influenced by the intravenous injection of alkali those of the former might also be.

On this theory two cases of benign tertian malaria were treated in this way with beneficial results on the symptoms, and in one case morphological changes on the parasites occurred rather resembling those produced by quinine treatment. Encouraged by these results, I have tried the effect of quinine combined with alkali in the treatment of malaria.

On theoretical grounds apart from the "anaphylactoid" theory this treatment should be beneficial, because Acton (1921) found in the case of a protozoon (*Paramecium caudatum*) that the lethality of the cinchona alkaloids was increased seven-fold by a slight increase in reaction towards the alkaline side, and from his observations thought that alkalies might be beneficial in malaria. Michaelis (1922) also showed that the cinchona alkaloids were more lethal to bacteria when in an alkaline medium than when in an acid one.

MacGilchrist (1913) brought forward arguments to show that an "acidosis" was present in malaria and applied his theory to the treatment of blackwater fever, and Symons (1922) states that an "acidosis" is present in malaria. Some experiments recently made by me seem to bear out this conclusion.

From the results of the observers quoted above it would appear that quinine acts better in an alkaline medium.

The usual mode of oral administration of quinine is in an acid solution, which, far from diminishing any tendency to acidosis," would tend to increase it. Similarly the other methods of administration of quinine would not tend to increase the alkalinity of the blood and make it a more favourable medium for the action of the drug.

Quinine has been known for several centuries to have a specific action on the symptoms of malaria, but the experiments conducted during the war show that it only eradicates the infection in a small number of cases irrespective of the mode of administration and the salt used.

It would appear that some adjuvant was needed to assist the quinine. Is this adjuvant alkali?

Most observers have noted the more efficacious action of quinine when given with magnesium sulphate, and Acton (1922) pointed out that this action may be due to the effect of this drug in diminishing the acidity of the portal blood.

Veale (1920) reported beneficial results in malaria after quinine combined with intravenous injections of Na_2PHO_4 —an alkali—and the two standard treatments of blackwater fever—Hearsay's and Sternberg's—are both alkaline treatments.

The effect of alkalies on the reaction of the blood is not so simple as might appear at first sight, and it is hoped to go more fully into this point in a later paper.

It is known that the peripheral blood is more alkaline than that of the internal organs. Can this be the reason why quinine treatment makes the parasites disappear more quickly from this blood than from that of the internal organs?

CLINICAL RESULTS OF THE QUININE AND ALKALINE TREATMENT.

In choosing cases of "fever" for treatment only those cases were taken in which malarial parasites were found on blood examination; the cases of benign tertian malaria being kept in a different group from those of malignant tertian.

Each group was divided into two parts, those in the first division being placed on quinine and alkali treatment, and those in the second on quinine treatment as described below.

In placing the cases in these divisions no account was taken of severity of symptoms, &c., each case as it was diagnosed being placed strictly alternately in one or other division.

The bloods of the cases were examined at the end of the treatment, and again at the end of each week for eight weeks.

The cases treated were Indian prisoners in the Lahore Jail, and on completion of treatment were discharged from hospital to their usual duties, except in a few cases, with anamia and debility, who were given a course of iron and arsenic tonic.

The mixtures used in these cases were as follows:—

¹ Abstracted from the *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923.

Mixture A.—Sodii. bicarb.	60 gr.
Sodii. citras	40 "
Aq. ad	1 oz.
Mixture Q.—Quinin. sulph.	10 gr.
Ac. sulphur. dil.	10 min.
Magnes. sulph.	60 gr.
Aq. ad	1 oz.

In future it is proposed to use citric instead of sulphuric, as the former is a much weaker acid, and the citrates formed become carbonates on absorption into the blood.

All cases were given 1 oz. of magnesium sulphate before the commencement of treatment. In the morning those in the alkali division were given 1 oz. of Mist. A. at 7.30 a.m., repeated at 9.30 and 11 a.m. About fifteen minutes after this last dose 1 oz. of Mist. Q. was given. At 6 p.m. 1 oz. of Mist. A. was given, followed by 1 oz. of Mist. Q. For the next three days 1 oz. of Mist. A. was given thrice daily (7.30 a.m., 11.30 a.m., and 6 p.m.), followed in each case by 1 oz. of Mist. Q.

This completed the treatment of these cases.

The cases in the quinine division received the same doses of Mist. Q. at the same times that the alkali series received their quinine. The total amount of quinine given in each case of either series was 110 gr. during four days.

DISCUSSION.

In comparing the two treatments described above, it must be remembered that the quinine-mag.sulph treatment is also an alkaline treatment, as magnesium sulphate tends to lower the acidity of the portal blood, so a greater contrast might have been obtained if these latter cases had been given quinine without any magnesium sulphate.

In spite of the chances of reinfection it will be seen that the results compare favourably with those obtained by other workers, as far as relapses are concerned, and that the effect of the alkali treatment on the fever is favourable to that treatment, especially in the benign tertian cases, but it must be remembered, however, that the number of cases recorded here is small, and the results may be pure coincidence due to chance distribution.

EFFECTS OF QUININE AND ALKALI ON GAMETOCYTES.

Thomson (1914) stated that the gametocytes of *P. falciparum* require 20 gr. of quinine thrice daily for three weeks to free the peripheral blood of them, and other observers have noted the ineffective action of quinine on these forms.

In four cases which showed very numerous crescents in thin films before treatment, when treated with quinine and alkali these forms could not be found in thick films after four days. Veale (1920) with this treatment also noted a marked diminution in the number of crescents.

If the alkali acts as an adjuvant to quinine in the eradication of crescents it will be of great importance in relation to malarial carriers, but the matter requires further investigation.

SUMMARY.

The results recorded above are incomplete and the number of observations small, but both the clinical and theoretical points which have been raised seem distinctly in favour of alkalis as adjuvants to the action of quinine in malaria.

It is hoped that other observers will experiment with this line of treatment and so help to prove whether it is of any practical value or not.

THE STATUS OF THE NEGATIVE WASSERMANN REACTION.¹

By R. A. KILDOUFFE.

THE Wassermann test, at present, is virtually the only guide available for estimating the efficiency of treatment, and it is in this connection, perhaps, that undue value and reliance have been placed on a negative reaction, the result of attributing too great a significance to a single test and too little importance to technical details. Certain general principles must be adhered to if the Wassermann test is to be—as it must be—intelligently utilized as a guide to treatment.

A negative Wassermann reaction is of no value and has no significance if the test is made while the patient is still under medication. The specimen cannot safely be taken until three or four weeks have elapsed after the cessation of treatment.

Treatment can never be safely discontinued until a negative reaction has been obtained with a cholesterinized extract.

A single negative reaction is not to be relied on as indisputable evidence of complete cure. It must be reinforced and corroborated by further negative reactions at appropriate intervals before the permanent absence of syphilitic reagin can be assumed.

A negative result occurring during or shortly after the ingestion of large amounts of alcohol is of no significance.

It may not be amiss here to discuss briefly the relation of the negative Wassermann reaction to the determination of the cure of syphilis. Much has been written in the past, and many caustic shafts have been levelled at the domination of the treatment of syphilis by the Wassermann test, but time tells its story, and the increasing weight of experience has rendered the test well-nigh impervious to assault. Syphilis is a curable disease under certain conditions, but it is a wise man or a rash one who assumes the ability to tell when it has been cured. As far as can be ascertained, there are only three criteria by which the absolute cure of syphilis can be ascertained: (1) The contraction of a new chancre; (2) a persistently negative Wassermann reaction with blood and spinal fluid, coupled with (3) the absence of symptoms of any kind.

¹ Abstracted from the *Journal of the American Medical Association*, vol. lxxix, No. 27, December, 1922.

It is now known that, in a high percentage of so-called "Wassermann-fast" cases, cerebrospinal symptoms develop; persistent efforts are therefore indicated to make the Wassermann reaction negative.

The negative Wassermann reaction is the only available reliable evidence at hand to determine the absence of reagin, and consequently of interaction between the spirochaetes and the tissues at the time of the test, and a single negative reaction is of no value *per se* as indicating the permanent absence of reagin.

The only safe plan to follow in deciding whether or not a sufficiency of treatment has been administered in a given case may be thus outlined:—

(1) After the completion of two courses of treatment (arsenicals and mercury), a Wassermann test should be made one month after treatment has been stopped.

(2) If this is negative no further treatment should be given, and the test should be repeated at the end of the third month following the cessation of treatment.

(3) If this is negative, the test should again be repeated at the end of six months and one year after the cessation of treatment.

(4) In the second year the test should be repeated at least twice.

In addition, since we know that involvement of the central nervous system occurs early rather than late in the disease, there is a growing opinion that no case should be dismissed until a negative spinal fluid Wassermann reaction has been obtained.

If consistently negative Wassermann reactions have been secured during the foregoing period, the patient may be dismissed from observation with a fair degree of safety; but he must be earnestly impressed with the necessity of having his Wassermann reaction taken at two- or three-year intervals during the remainder of life, if without symptoms, and at once if suggestive symptoms appear.

CONCLUSION.

A negative Wassermann reaction is of value only when intelligently interpreted in conjunction with the other findings; a single negative reaction is of little value in the presence of suggestive clinical findings; and as evidence of cure, a single negative reaction is worthless.

Medical News

HEALTH IN DOMINICA.

ACCORDING to a report by Dr. Nieholls on the Roseau Hospital it appears that the total of mortality due to yaws is decreasing yearly. In 1921 there were 54 per cent. of deaths, while the number in recent years ranged from 6 to 10 per cent. From the 66 cases of malaria which received treatment there

were no deaths. Pellagra has appeared in the hospital returns during recent years, and its incidence is apparently due to the want of proper nourishment and the miserable condition of the lives of the lower classes. The number of venereal diseases have increased in the island, but it is hoped that before long concerted measures will be taken to prevent the spread of this disease.—*The West India Committee Circular*, January 4, 1923.

THE LATE NORTH PERSIAN FORCES.

WE have been asked by the War Office to announce the institution of a Memorial Trust Fund, commemorative of the services of the late North Persian Forces, which has been subscribed by officers of the Royal Army Medical Corps and Indian Medical Service who served with these Forces.

In accordance with the desire of the subscribers to encourage the study of Tropical Medicine and Tropical Hygiene it has been decided that the Memorial should take the form of a silver medal, to be known as the "North Persian Forces Memorial Medal," to be awarded annually for the best paper on Tropical Medicine or Tropical Hygiene published in any journal during the twelve months ending December 31 by any Medical Officer, of under twelve years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or of the Colonial Medical Service.

The first award will be for the best paper published during the twelve months preceeding December 31, 1923.

The award will be announced in the latter part of the year following that in which the paper was published, provided that the Memorial Committee consider the papers published to have attained a standard of merit justifying an award.

THE Fifth Congress of the Far Eastern Association of Tropical Medicine, Singapore, Straits Settlements, September 3rd—17th, 1923.

Hon. Secretary and Treasurer for Malaya:

J. W. SCHARFF, M.D., D.P.H.,

GOVERNMENT HEALTH OFFICER, SINGAPORE.

Anyone desirous of attending the Congress, or wishing to submit papers, should communicate with the Honorary Secretary.

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Original Communications.

THE TREATMENT OF BILHARZIASIS WITH ANTIMONY.

By J. E. R. McDONAGH, F.R.C.S.

SOME years ago I found that in various diseases antimony is particularly useful when other drugs no longer work, especially in infections, the causative organism of which takes on an intracellular habitat, such as in *Granuloma pudendi* and *Ulcus molle serpiginosum*, which are probably two forms of the same disease. It is interesting to note that antimony causes the cutaneous lesions of leishmaniasis to vanish, while arsenic will not touch them, and it will likewise heal syphilitic lesions caused by the asexual development of the *Leucocytozoon syphilidis* which do not yield to arsenobenzene, mercury, or iodine. The exact rôle played by antimony in these diseases is by no means clear, nor is it known if its action is the same therein as in bilharziasis.

Recent experimental work which I have undertaken shows antimony to behave as a metal and not as a non-metal—that is to say, as a conductor, and not as a condenser of electricity. Antimony appears to have a direct action upon animal parasites, excluding protozoa. It destroys the cells harbouring micro-organisms, thereby rendering the latter more vulnerable to the destructive action of the protein particles in the host's plasma.

I have used three preparations of antimony: (1) tartar emetic, (2) antilueticin, (3) colloidal antimony sulphide, and from recent experience I have found that intravenous injections of tartar emetic are the most suitable. Antilueticin, which is potassium ammonium antimonyltartrate, can also be used with good results when injected intravenously, but it produces severe pain when injected intramuscularly. Colloidal antimony sulphide is an unstable colloid, and even when injected intravenously freshly prepared it is not so efficacious as tartar emetic, and intramuscular injections cause too much pain. In bilharziasis intravenous medication appears to be much more effective than when the intramuscular route is employed. It is more than probable that the sulphur in the colloidal preparation detracts from the action of the antimony, because the employment of the carbon di-sulphide product of di-ethyl-amine (contramine) will immediately counteract any harmful effect produced by tartar emetic. Antimony is a toxic metal, but not in the doses usually employed, unless the recipient happens to exhibit an idiosyncrasy thereto. From experiments undertaken on rabbits, I have found that the toxic effects produced differ in no way from those caused by arsenic, and that the liver is the organ most frequently attacked. This is likewise the case in man, jaundice being more frequently met with than albuminuria, but fortunately, both in man and animals, recovery follows the use of contramine, provided it is employed soon enough. In view of this the practitioner need have no fear of inject-

ing tartar emetic in bilharziasis up to 30 gr. or more. I have ampoules made up containing 1 c.c. of distilled water and $1\frac{1}{2}$ gr. of tartar emetic. It is best to dilute the contents of an ampoule with water and inject about 30 c.c., as concentrated solutions are apt to cause venous thrombosis and temporary mild shock, which is exhibited by violent fits of coughing, feeling of constriction around the neck, with occasional swelling of the lips and tongue. About ten injections prescribed at five-day intervals is the average number required.

Unfortunately, there are no means at hand to detect when a patient is radically cured, but those cases which do relapse appear to respond equally well to a second course of injections. The case which I have had longest under observation without relapsing received treatment over nine years ago.

In conclusion, I may perhaps be permitted to remind the reader that the antimony treatment of bilharziasis was first introduced and published by me before any other observer, though apparently this fact has escaped the notice of some recent writers on this disease. The first mention of this method of treatment appeared in my "Biology and Treatment of Venereal Diseases," which was published in 1915.

"BLACKWATER," A DISEASE OF METABOLISM.

By G. ROME HALL, M.D.Durb.,

Ex-Senior Medical Officer West African Medical Staff.

THE view put forward here is that hæmoglobinuric fever is a disease of metabolism, and that the final stages resulting in "blackwater" are intensely influenced by any process of pyrexia coincident with it or preceding it.

It is nearly thirty years ago since I saw my first case, at a time when the causation of malaria was as obscure to the ordinary practitioner as blackwater is now. In my first tour of Coast service, and for that matter since, I always listened with interest and attention to the views of the old Coasters, reasoning that they were in the position of pioneers in a new country before the surveyors and others came along. I regret that this was not the position taken up by many of the first School of Tropical Medicine men who came out soon after. We were their pioneers, and our views were often considered valueless.

The views of the laymen of long standing were these: They distinguished two great forms, one occurring with high fever, or coming on in the course of such, and a much milder form; they did not ignore an occasional severe attack with low fever symptoms. They laid stress on the original urine passed; if the first abnormal kind was only smoky it was considered a favourable sign; if like treacle, a grave case.

The occurrence of severe vomiting, even if not black, was considered a bad sign; also delirium from early on. It was considered there was some connection between "blackwater" and ordinary

malaria, and that it also took at times an epidemic form. It was not unnoticed that the type of man who got well, when often gravely ill, was the hard case who refused to die, while the milder missionary often succumbed. Possibly the former speeds up by thyroidism.

Two types of the milder form were recognized; the two extremes are what I may call the bush type and the office type. In the former a man was in the bush, some weeks perhaps; he came down apparently in real good health; but the first night was his trial. If he had too good a feed, a liberal amount of liquor, plus sexual intercourse; no one was surprised if he started blackwater next day. The office type was a man of coast sedentary life, with whom you might have dinner one evening; nothing special was apparently wrong with him. There might have been recently repeated smouldering fever. Next day you saw him for this disease.

It was recognized that blackwater did not occur whilst you retained your European tonic and constitution. As it was more than once phrased to me, you did not get the disease as long as you kept your vital powers above a certain point.

It was considered, to be a fact that then, as it is now, those who were living with native women were most liable to blackwater fever. To this I would add: if there is coincident neglect of skin hygiene and too much liquor, the risk is much increased.

It was held that those who, as a habit, had native "chop" of a morning—that is, the groundnut or palm-oil soups, were those who became old coasters, especially if they respected the sun.

Those were the days when the custom was to take quinine for your first six months, except you successfully passed your "seasoning fever" earlier. Nowadays men expose themselves in reason to the sun without much hurt in a way they could not do then. I attribute this greater resistance to "sun" to the systematic use of quinine as taken now.

About twenty-six years ago the Germans methodically investigated malaria and blackwater in the Cameroons, which they occupied in 1884. I regret I cannot quote their publications, but I memorized three points: That the native child up to about 4 was a source of acute malarial infection, that the older natives were only such when the infection had become active. Also that the effect of too much "sun" was the formation of toxic "albuminoids" in the blood. My idea is that the normal proteins did not complete the chain of breakdown products. They stated that men did not get blackwater if the blood count was over 70 per cent., not that a man must get it if below that. If this was their finding, it is only putting the lay view of a certain amount of depreciated vitality being needed into figures.

There seems to be now a definite movement to study disease from the point of environment in the fullest sense of the human being; to investigate what conditions result in disease; that in the end

it pays to keep the soil of a field so healthy that it will not grow weeds rather than to become an expert in weed-killers. In an army all branches of service are equally necessary and interdependent, yet it has been the fashion for the man whose bias is to the clinical side of work to be considered a superfluity in medical ranks.

In West Africa the factors causing disease are many, only to be appreciated by those who have lived there, and to the full only by constant dispensary work and living in the bush and outstations. There is the food question; that of the sun, with actinic rays of perhaps greater virulence here than anywhere else; questions of infections; the mental state induced; and in any case the inevitable atonicity, except in those few who can be considered to have freak constitutions.

One of the many medical surprises of the war was the occurrence of hamoglobinuric fever in the Salonika regions; another was the number of men who had latent malarial infection. They might have been two or three years in malarious regions, persistently taking quinine, with no record of the disease on their medical history sheets. All they knew was they had had one or two bad "colds," or severe headaches, or "touches of the sun." Such cases came home, and the first winter wakened into activity their latent infection. To quote from Drs. Leonard Parsons and J. Graham Forbes, the following statements are specially interesting: "The cases seem to have been generally of the milder type; the disease was most prevalent in the winter. Although no malarial parasite could be found in the greater number of cases, the men had always been in malarious regions; they did not obtain evidence of any specific lysis." The mild character is explainable by their not suffering from tropical atonicity, and there rarely seems to have been any other concurrent disease. That it came on usually in the winter falls in with the Coast idea of some shock being needed to precipitate the attack, just as chill in West Africa from rain or unchanged sweat-laden clothes will determine a malarial awakening.

But although latent there are degrees of minor activity, to be measured, I believe, other causes being checked off, by the amount of urea excreted. Coming out once from leave after a severe spell from malaria on the Coast, I took daily on board ship the amount of urea excreted in a morning sample for nearly twenty days. I took care that exercise and nitrogenous foods kept a daily average. The days I missed taking quinine were followed by about twice the usual amount of urea next morning.

It is then most probable that on the Coast any of the recognized causes of stirring up latency will often cause only minor disturbances, one being the break-up of more than the usual number of red cells. Of course, such is also the result of any pyrexia. One phase of Coast health is that the man who has malarial infection controlled by quinine has decided altered metabolism on being exposed to any of the states that reawaken latency. In my

own case I have found after great exertion a mouth temperature of 99° F., and the skin of the chest where there had been profuse perspiration 93-80° F. In such a state there is the aceto-acetone odour of the perspiration, the hand rubbed across the forehead feels as if there is something gritty there, and the urine after passing is very soon ammoniacal; it is also very often phosphatic.

The researches of C. J. Bond, C.M.G., F.R.C.S., into Blood Serum and Agglutinative and Opsonic Action seem to prove, amongst other points, that, although whole blood cells are not toxic to their own leucocytes, they are highly so if broken up.

In the mildest form of hæmoglobinuric fever there is no complication, practically no fever, and there seems to be but little the matter except the smoky-coloured or "port-wine" urine and signs of minor prostration with a hæmogenous jaundice. He is a man who has been some time on the Coast; it was not expected to occur under the first six months), by which time the ordinary European had been acclimatized to his natural West African state. But no man who had been sufficiently long out, the disease might start at home in the cold climate, as in the Balkans area cases. He was therefore a man of depreciated vitality, the Germans said, with a 70 per cent. blood count. There was often some definite exposure, hardship, or upset of some kind blamed for the attack. One cause was thought to be a fatiguing day's travel in the bush, no proper midday meal, and often not even at night. Old coolers used to carry small bottles of champagne for such emergencies. There was usually the incidence of "shock" of some kind.

The man coming from the bush had undergone special depreciation if there for some weeks; his diet had been mostly vitamin free. Bread from white flour, tinned foods of all kinds, butter—mostly margarine in reality—tinned vegetables, and white rice. Except a man stopped in one place in the bush it was difficult to obtain eggs, the only source of good fat; the ordinary cook will not make ground-nut soup or palm-oil soup, both rich in vitamins as made by the natives. Women only make the necessary trouble.

He came back with his blood specially wanting in the essential salts needed for general tonic. There was often the question of bad nights' rest from sleeping in villages receiving no breeze except in the forms, the difficulty of a proper bath, and profuse perspiration.

This latter condition is important. I once made over three weeks observations upon myself in one of the hottest Coast stations, being away from my quarters some three hours in the morning and over two in the afternoon, having altogether a three-mile walk in that time. I knew the weight of my clothing—I weighed it each time on return. It worked out at an average weight of fluid added in the morning of 30 oz., and afternoon of 16 oz. On one occasion I had late in the evening a difficult instrumental labour: the third weighing made 80 oz. of water in my clothes for the day. This did not

take account of what I had lost by evaporation, nor, on this special occasion, of what I left on the floor of the hut.

One result of a flood of perspiration is to upset the balance of the intestinal circulation with constipation caused by too hard faeces. But such must also increase the amount of salts eliminated, and the wastage of the Na and K salts and the necessary phosphatic and sulphate anions. Such fluctuations in the water content of the blood must not only affect it and its contents, but the lymph spaces and tidal action as well. And it is in this latter system that there is more metabolism than in the blood circulation.

In such a case not only is the blood hypotonic in salinity, but it is liable to be surcharged suddenly with colloidal proteins or derivatives. It may be from unwise feeding. In the old days the deficiency in vegetables and pasture-fed meat was made up with many by too much proteid diet, such as it was. It might be from chill, which I believe, if excessive, interferes in metabolism, or it might be from sun exposure. *In vitro* serum albumen and serum globulin coagulate at 140° F.; often the sun is 155° to 160° F. Hence the prevention of immediate hurtful results is only due to the vital resistance of the skin and tissues to the passage of the heat rays. But there is also another very definite factor of injury in the intense actinic rays: the more overcast the sky is the greater is their intensity.

When colloids turn into toxins there is greater need than ever of a greater salinity, for "crystalloids take the toxic colloid through the intestinal mucosa or renal epithelium." These "toxins," of whatever form they are, in the mildest cases result in some injury to the tubules and in the formation of renal casts. Drs. Parsons and Graham describe in the transient cases "repair begins at once, for casts are obvious in the first specimen of blackwater passed. In the severer cases which recover casts are at first seldom seen, or are only seen in small numbers. Later they increase in number until they reach a maximum, when they may be present in enormous numbers, and then gradually diminish, finally disappearing altogether."

In these mild cases it would appear as if the lymphoid system and its products were at the beginning in a state of relative integrity, and the cell debris either insufficient in quantity or quality to cause its disfunction. The phagocytes and antigens are evolved at once in response to the demand, the malarial protozoa are kept in relative quiescence, and the kidneys excrete the toxins, a minor degree of casts being no more than evidence of physiological hyperfunction.

In the next grade of cases the lymphoid system takes some time to respond to the call for its services. It may be that the ultimate colloidal and crystalloidal balance in the nerve cells has been sufficiently upset to cut off at first the extra innervation the lymphoid trophic mechanism is needing.

There must be such a thing as a natural exhaus-

tion point for the formation of phagocytes and antigens in cases where there is a perpetual demand for special functioning. From observation I am inclined to advance this as a practical point. A man free from organic disease and under hygienic conditions can normally manufacture immunity to three infections or toxic states; to expect him to speed up to meet a fourth is to seek disaster. It is stated now that those exceeding in alcohol and nicotine develop antitoxins. Many people have latent streptococcal and tuberculous infection; so many men on the Coast, if they smoke and drink in the least excess, are already burdened to the three-fold resistance without adding on malaria. Or, otherwise, a man who has these first two habits to excess reaches the limit if he only adds on latent malaria. Alcohol is in excess when causing cell membranes to be less permeable to ions. The old rule was to forbid smoking in convalescence for as many days as there had been pyrexia. Relapses were constant from neglect of this rule.

Not only is there the question of the intricate balancing of cell contents, but there is also that of the integrity of the cell membrane everywhere, probably depending for their perfect functioning upon the completeness of the Helmholtz's double ionic layer. It is just as essential that the membrane should be supplied with its vitally needed sulphates and potassium ions as that the protoplasm should not have its lecithin supply interfered with.

Whereas the largest factor in the bush type of blackwater appears to be due to under salinity, both of blood and cell membranes, so the office type was led up to by the accumulation of an excess of colloid material, salinity not being greatly at fault. But in either case once the balanced control of waste and repair had been upset the result was the same, excessive hæmolytic action and injury to kidney tubules already sharing in a general atonicity.

The point is that the perspiring constitution is, once fluid ingested has restored such to the normal atonicity, wanting in that amount of salines needed to ensure the stability of the blood system which constitutes the wholeness of health. In his state, although he may be generally in equilibrium, he is so unstable that there is merely needed some special small injury to upset not only the composition of the proteids of the blood and the red cells, but also of the master cells of brain, medulla and heart. "Shell shock" showed how small a special injury may be.

To quote from Dr. Benjamin Moore, referring to anaphylactic shock: "The common cause of all these phenomena is a disturbance of that delicate equilibrium between the colloids of the blood and cells (such as proteins and lipoids) and the crystalloids (such as sodium chloride) existing united or absorbed in common solution or suspension. There is clear evidence that the stability, or state of aggregation, of a suspension of lipoidal nature varies with the concentration of saline or electrolytes in common solution with it."

For equable life manifestation there must not only be equilibrium in the blood between the crystalloids and colloids, but this state must extend to the same substances in the master cells, where the balance is still more sensitive. These master cells depend for their nutrition upon the bloodstream, and if there is sudden depletion in the latter there is shock.

To refer now to the graver variety, which gave to blackwater its excessively evil repute. It is so because it either comes on in this class as the terminal phase of some acute pyrexial complaint, or nearly coincident with it. It must be remembered that just as nearly all of us at home have the latent pneumococcus, so nearly everyone in West Africa has latent malaria. Since in that condition the infection has its last lurking place in the interior circulations of liver and spleen, the ordinary blood test is merely negative.

In the turmoil of altered metabolism in high pyrexia, whether due to malaria or yellow fever, enzymes, harmless at ordinary temperatures, have their chance. They are stated to act with greatest force at 104° F. Certain digest proteids with the result of shock. This upsets the balance of hydroxyl and hydrogen ion concentration, with immediate effect on red cells already breaking up. Once enough red cell debris is formed a case becomes toxic to his own leucocytes. Sometimes the yellow fever pyrexia upsets the control of latent malaria. This gave the idea of epidemic blackwater.

So phagocytes, derived from leucocytes, fall off in number just when they are most needed, and opsonin, supposed to be a side product in the development of the latter from lymphoid tissue cells, will not be created. Also, opsonin and other products, accepted as needful in the side chain explanation of immunity, will, being proteids, also be broken up.

Once enough red cell debris exists to interfere in the normal activities of lymphoid tissue there is started a chain of evil circumstances resulting in more and more toxic proteins and other products in the blood. One result is the increase of osmotic pressure in the capillaries and retention of waste in the lymph spaces, where metabolism mostly takes place; there is oxygen starvation of the ultimate cells. Owing to this want of phagocytes and the needful opsonin the plasmodia will so rapidly develop that a fatal ending is a foregone conclusion. The kidneys break down under the strain of passing out toxins, and the patient dies after perhaps three or four days of suppression from protoplasmic oxygen starvation.

The treatment by saline injections has not had in the grave cases very high results, the blood is not only craving for saline in the shape of ions of Na, but for potassium and sulphion ions as well, to supply to the cell membranes. Drs. Parsons and Graham report: "In fatal cases, fatty degeneration of the myocardium and necrotic changes found in the liver and spleen." "We consider the uræmia and anuria are due to these renal changes

rather than, as is usually held, to the mechanical effect of blocking of the tubules with hæmoglobin."

In the old days we had no ice, only sweet condensed milk, and broth made from stringy fowl, old goat, or tough sheep.

Our treatment was to keep the patient just warm, sponging sufficiently with warm water to keep the skin clean, and if there was pyrexia to be controlled, sponging with cold water, with vinegar and lime-juice added, doing so from the extremities towards the heart, keeping the brain specially cooled by compresses.

Until renal disability set in we gave small doses of champagne, or of brandy with soda-water, on signs of cardiac fatigue, at stated intervals. The patient could have as much soda-water as he could drink. I have since wondered if the carbonic acid could have stimulated the medulla. We gave demulcent drinks but no alcohol, except administered effervescent. Warm blanket baths were reserved for delirium or for rising temperature; the cold pack was regarded as only justifiable as a last resort.

Personally, I used the old mixture: Sp. ether nit., pot. bicarb., and pot. nitrate. The mildest cases got well without medicine. But if there was a bad malarial history, or anæmia without such, I gave in addition, alternating with the mixture, as soon as the stomach would stand it, 1 gr. doses of quinine. I did not consider that this every four hours depressed a tropical constitution; the idea was to be ahead of malarial activity when it started. In future I shall certainly try thyroid to see if it can stimulate the lymphoid system.

Of course, it is well known there are some freak cases of blackwater in which anything beyond a moderate dose of quinine induces the disease by shock.

In connection with the renal disease it is recognized that in ordinary people shock may be followed by a fulminating degenerative nephritis.

I give these views for what they are worth. They are only stated as pioneer experiences, and not as staff work. Medicine will make its greatest advances when the clinical and every-day life observer meets over the patient with the research practitioner and expert. At present the two are far too much divorced from mutual exchange of views. The staff workers do not always exhibit the highest fraternal spirit.

THE VIRULENCE OF *BACILLUS METADYSENTERICUS* (CASTELLANI) IN THE RABBIT. ITS RESISTANCE TO THE ACTION OF SUNLIGHT.

By G. OLIVI, M.D.

Pathologist, Trento Hospital.

Bacillus metadysentericus was first isolated by Castellani in the tropics and in the Balkanic-Adriatic zone during the war from a few cases of dysentery. Morphologically it is identical with the germs of the Shiga-Krise and Flexner group, to which it is related also biochemically. It does not

produce gas in any sugar; when isolated recently it produced acidity in a very large number of sugars, including lactose. After a time it loses the property of producing acidity in lactose; does not liquefy either gelatine or serum; does not clot milk; produces indol.

The organism is agglutinated by an homologous serum, but not by Flexner or Shiga serum. I have studied its virulence in the rabbit as follows:—

A twenty-four hours' culture in peptonized broth was injected subcutaneously in the back of three rabbits as follows:—

Rabbit No. 1	weighed 1,450 kg.,	broth culture 3 c.c.
" No. 2	" 1,795 "	" " 2 c.c.
" No. 3	" 1,790 "	" " 1 c.c.

After twenty-four hours:—

No. 1 exhibited much infiltration around the point of injection, spreading along the anterior limbs.

No. 2 showed less infiltration, but with the same characteristics as No. 1.

No. 3, no tumefaction appeared, but the animal avoided placing its paws on the ground.

After forty-eight hours:—

The same symptoms were noted, but were more severe in No. 1, which, however, still took nourishment.

Rectal Temperatures.—No. 1, 36.6° C.; No. 2, 40.2° C.; No. 3, 39.6° C.

After four days:—

The symptoms remained in aggravated form in No. 1, accompanied with prolapse of the rectum.

	Rectal temperature	Weight
Rabbit No. 1	... 39.5° C.	1,240 grm.
" No. 2	... 39.5° C.	1,600 "
" No. 3	... 39.4° C.	1,660 "

After five days:—

Death of No. 1 occurred. Weight, 1,230 grm.

In rabbits Nos. 2 and 3 the symptoms subsided.

On the seventh day:—

	Rectal temperature	Weight
Rabbit No. 2	... 39.8° C.	1,610 grm.
" No. 3	... 39.8° C.	1,620 "

On the thirteenth day:—

	Rectal temperature	Weight
Rabbit No. 2	... —	1,640 grm.
" No. 3	... —	1,660 "

In both animals a large abscess appeared at the place of injection, which suddenly opened toward the surface. After a month the two surviving rabbits had increased in weight above that of the day of injection.

Autopsy of No. 1 rabbit showed inflammation of the large intestine with enlargement of the spleen. Sowing matter from the infiltrated region near the point of injection, and blood from the heart and spleen into broth and solid media (peptonized agar) a bacillus was grown with all the characteristics of the one injected.

In order to test the virulence of the germs isolated from the dead rabbit, I injected another rabbit weighing 1,910 grm., with 2 c.c. of twenty-four hours' broth culture, employing the same technique already described.

After twenty-four hours the animal looked ill.

and a tumefaction appeared at the point of inoculation.

After forty-eight hours the tumefaction spread a great deal. On the fourth day the weight of the rabbit was reduced to 1,820 gm., and on the twentieth day to 1,770 gm. However, the animal did not die.

The result of this brief investigation shows that the virulence of *B. metadysentericus* Castellani is less marked than that of *B. Shiga-Kruse*, as 3 c.c. of twenty-four hours' broth culture were necessary to kill a rabbit weighing about 1,500 kg.

The symptoms shown by the inoculated rabbits point to the toxin of this germ being similar to that of the Shiga-Kruse type. The inflammation of the intestine was identical with that found in rabbits inoculated with Shiga-Kruse.

The formation of abscesses, which is also often observed in experiments with Shiga-Kruse and Flexner, shows the pyogenic tendency of the germ.

I also carried out experiments to compare the behaviour of the germ to indirect and diffuse sunlight in comparison with other non-spore forming intestinal germs, and I obtained the following results:—

(1) It shows resistance to direct sunlight for one and a half to two hours, and is still alive after six hours' exposure to diffuse light; this is almost identical with the results obtained experimenting with *B. dysentericus* Flexner.

(2) The staining properties of the germ remain unchanged.

(3) There is no variation in the indol-nitrite reaction.

Rocha-Lima's Technique of the Preparation of Anti-exanthematic Typhus Vaccine, with the Modifications of Weigl (G. Rosenberg. *Bull. Office International d'Hygiène*, December, 1922).—Anti-exanthematic typhus vaccine is prepared from *Rickettsia prowazeki* cultivated from the digestive tracts of lice which have been fed upon cases showing clear clinical signs of the disease. The details of technique are described.

DIMOL

In an article on "The Use of Rhubarb in Acute Bacillary Dysentery," by Major H. C. Brown in the *Lancet* of February 24, 1923, occurs the following paragraph:—

"For purposes of contrast and control cultures of *Bacillus dysenteriae* Shiga and *B. dysenteriae* Flexner were submitted to the action of the intestinal disinfectant dimol. Five c.c. of the dimol lavage solution was taken and to it was added 0.2 c.c. of a filtered broth culture of the above organisms; cultures were taken at varying time limits from two and a half minutes, and all these cultures remained sterile. This lavage solution, therefore, of which one quart is administered, is capable of killing dysentery bacilli in two and a half minutes."

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 16, 1923

THE NEW SCHEMES FOR POPULATING AUSTRALIA.

THE newly evolved schemes for increasing the population of Australia and thereby lessening the overcrowded Homeland is responsible for the weekly exodus of our brethren; although, according to clerical nomenclature, the word brethren includes

both men and women, in the present instance it refers almost solely to men. Almost all the schemes include tempting offers; for Australia requires a bait of some sort to stimulate emigration and attract the home dwellers. In the first instance British folk were sent there by compulsion; then the finding of gold and silver mines attracted and brought a marked increase in rushes to an apparent eldorado of riches, which in most instances proved to be real at any rate to the early seekers after wealth, and Mount Morgan was the magnet that fascinated. Now arrangements for *cheapened passages and grants in money* towards settling on the land tempt our male population and go towards gilding the bait which attracts. One has only to see the packed railway carriages which leave our cities, and especially London, to realize how great the exodus has come to be. Circumstances and necessity are the *driving forces* which contribute largely to this state of affairs, and these are further assisted by various forms of attraction in the way of favourable opportunities offered in Australia itself.

Time was, and that but recently, when Australia was avoided by the human race, and even the crowded masses of humanity in India, in the Malay States, in China and Japan left Australia severely alone, and it was only when the pioneers from Britain proved that it was a habitable and an attractive dwelling place that the over-populated lands of adjacent countries were tempted to go there. The original British settlers there however, were jealous of the invasion of coloured folk, and it gradually came about that legislation was introduced to limit an inroad, and finally to exclude the possibility of coloured folk acquiring land or establishing themselves in commerce as Australian citizens. The original settlers from Britain were mostly from our great cities, and town dwelling still proves itself to be the chief attraction to its people. As the factory life in Britain flourished our rural population grew less and less, until nowadays the drainage upon our farm community at home has left but few to spare to go on the land in the Overseas dominions. Town dwellers are not ideal colonists, and few are willing to go "back to the land" to make a livelihood. The collapse of grain growing—since the war—in England, during which period it showed great possibilities, and the return of the land to growing grass has set free a number of ploughmen and has given a filip to the emigration of farm labourers to the great benefit of Australia, for many have gone thither, and the recent strikes amongst the farm labourers in some of the agricultural counties increases the number willing to go to Australia—a great good really to the Empire. The men, however, are going to Australia because they are dissatisfied, and they will always regard the Old Country with a grudge for causing them to leave home, even if they lead successful lives in their new home, a frame of mind not calculated to bind the Empire together.

We are concerned immediately with Tropical

Australia, and in this we are assisted by a scientist of the first magnitude, a well-known geologist, Sydney B. J. Skertchly, late of H.M. Geological Surveys of England and Queensland, and formerly Lecturer on Anthropology at the London Institution, and Past President of the Royal Society of Queensland. His writings on geology are remembered when, as yet a young man, he wrote, along with Professor Geikie, that classic work, "The Geology of the Fen Country." Professor Skertchly's writings on the Australian tropical climate is worthy of close attention, and I here abstract a section of his "Tropical Australia."

"TROPICAL AUSTRALIA."

"Nearly one half of the States of Queensland and Western Australia and of the Northern Territory lie within the tropics, the actual figures being:—

	Queensland	Northern Territory	Western Australia	Total
	Square miles			
Within the tropics	359,000	426,320	364,000	1,149,320
Within the temperate zone	311,500	97,300	611,920	1,020,720
Ratio—tropical part to State	0.535	0.814	0.373	0.530
Ratio—temperate part to State	0.465	0.186	0.470	0.470

"The tropical part is about five-thirteenths of the whole Commonwealth, and it, hence, behoves us to deal critically, though rapidly, with its more prominent features.

"This division, it must be clearly understood, is entirely astronomical, and not climatological—a fact that is often overlooked when dealing with tropical climates. If land and sea were evenly distributed about the equator, and if the land were all of one elevation, and the sea uniform in depth, then the belt between the tropics and non-tropics would truly represent a climatological as well as an astronomical zone. But, as we all know, this is by no means the case; the land is chiefly gathered in the northern hemisphere, which is consequently the hottest, and, moreover, the height of the land within the tropics is so varied that, as in Mount Kenia, in Africa, one could spend the year in eternal snow right under the line. Altitude has as much to do with climate as latitude.

"A more practical division than the tropic line is a line of mean annual temperature of, say, 75° F.

"If we compare this area with corresponding areas in South America and South Africa, we find everything in favour of Australia—that is, if we deem tropical conditions unfavourable to the White Race, as they undoubtedly are. In both these countries the line of 75° F. comes much further south. That is to say, Australia, latitude for latitude, is more temperate in climate than other continental areas in the southern hemisphere, and much more so than for corresponding areas in the northern hemisphere.

"This is chiefly due to the comparatively high elevation of the greater part of the continent.

"Less than one half of the area of Australia drains into the sea. Taking the area of the continent as 2,948,366 square miles, no less than 1,567,000 square miles are comprised within the areas of internal drainage. Speaking broadly, the coastal regions, the area of the East Australian Highlands, and the river system of the Murray are the only areas whose surface waters reach the ocean. This, with the exception of the basin of Lake Eyre (417,000 square miles), which is below sea-level, is not so much due to the lie of the land as to the scant rainfall and consequent dry climate, favouring evaporation, not allowing of sufficient permanent waters in the channels to enable it to force itself through to the coast. In a more liberally watered area the rivers of equally level plateaux have cut channels to the sea with facility.

"This leads us to another important factor relating to tropical climate: humidity. How much this affects our comfort only those who have had experience can truly judge. To cite a personal experience, I had spent several summer months in the interior of China, constantly in the open air, with the temperature well above 100° F. for most of the long northern day. It was hot, burning hot, but not unpleasant, save that one's skin had a tendency to crack in the dry air. I returned direct to Shanghai to find many of the business houses closed, horses and men dropping in the street, and a general upset, all owing to the distressing heat. Yet the thermometer never overtopped 90° F. This is not only true of the White Races, but of all others so far as my experience goes, with the solitary exception of the negroes. The negro is the true child of the tropics; but even he is naturally and proverbially indolent. Italians are often spoken of as the children of the sun, and Italian skies are famed for their brightness. Yet the Italian has a proverb to the effect that none but dogs and Englishmen are seen abroad at noon; the siesta, the noon-day quiet, is a necessity alike for the Spaniard and the grasshopper. No nation, no race, has ever shown itself capable of continuous outdoor labour in the moisture-laden atmosphere of the tropics."

After a close and intimate study of the Chinese and white men, Mr. Skertchly comes to the conclusion that neither the white man nor the yellow man may abide continuously in the tropics of Asia.

"In what has just been said, I have been dealing with what may be called true tropical conditions—high temperature combined with great humidity. In such regions I am convinced it is quite impossible for the White Race, whether fair or dark, to maintain itself by natural increase. It is wilfully shutting our eyes to the most patent facts to deny this. The experiment has been made over and over again for centuries, with an unvarying result. Australia cannot possibly be a solitary exception.

"Let us, therefore, see how much of our continent comes under this ban. Happily the case is not so black as might be expected, seeing that nearly one-half of our land is tropical so far as mere temperature is concerned.

"A moist tropical climate is the result of a heavy

rainfall combined with low elevation. We have already seen that the greater part of a tropical Australia—the great western plateau—lies over 1,000 ft. above sea-level. Also that practically all the mountain area lies on the eastern border—the eastern highlands, and these are the great rain-condensers.

"In order not to over-state the case we will take a very liberal view of what constitutes a hot humid climate, and select the area having a rainfall of 50 in. and over per annum. This will be found to lie entirely along our north, roughly having the parallel of 15° south as its southern limit. It includes the northern portions of the Kimberley Division of Western Australia, Arnhem Land, the major part of Cape York Peninsula, and a narrow strip along the coast as far south as the tropic limit. The whole of this humid area is not more than about 17 per cent. of the tropic region. It does not embrace the southern coast of the Gulf of Carpentaria.

"As we go inland the rainfall steadily diminishes, but most rapidly as we go south from the south-western end of the Gulf of Carpentaria. About 71 per cent. of the tropic area has a rainfall of between 10 and 20 in., and over some 16 per cent. the rainfall is under 10 in.

"Viewed, then, as a whole, the Australian tropic region enjoys a far more favourable climate than much of the extra-tropic land, and both as regards temperature and rainfall is superior to the regions in the same latitudes in South America and South Africa. It is manifestly misleading to lump all our geographical torrid zone together, and to compare it, in the mind's eye, with the steamy forest lands of New Guinea, West Africa, or Brazil; only a limited portion—some 17 per cent. is of this nature, and here it is, in my opinion, foolish to think and act as if the white man would occupy it by natural increase. He may hold it; but only by change of personnel, never as true natives, never as labourers in the fields.

"But over 50 per cent. of the geographic torrid zone of Australia enjoys a climate the very opposite of this. Instead of being an enervating hot-house reeking with moisture, it is only moderately moist, possesses an adequate rainfall, and for half the year its climate might almost be called perfect. Here, if anywhere, the White Race might live in perpetuity even as he now can live in comfort. My conclusion is that our tropics as a whole are as habitable for whites as any other part of the continent, but neither more nor less so, always with the unqualified exception of the moist belt."

Mr. Skertchly holds that no nation, no race has ever shown itself capable of continuous outdoor labour in the moisture-laden atmosphere of the tropics, rendering a fourth generation either of the white or yellow races impossible.

J. C.

Annotations.

Ether Intramuscularly for the Relief of Hiccup (Charles L. Gibson, *Journal of the American Medical Association*, vol. lxxx, No. 6, February, 1923).—For the last two years, all cases of hiccup coming under the author's observation, more particularly after operation, have been treated by the intramuscular injection of 25 to 30 minims of ether. Dr. Allen Thomson, of New York, called the author's attention to its use in children for stopping the paroxysms of whooping-cough and thought that it might likewise be useful for stopping hiccup. If the original dose is not immediately successful, it is repeated one or more times at several hours' interval. Its administration is not painful and has never been attended with unpleasant circumstances.

An Experimental and Clinical Study of Quinidin Sulphate (H. M. Korn, *Archives of Internal Medicine*, vol. xxxi, No. 1, January, 1923).—The result attained by the use of quinidin in a case of ventricular paroxysmal tachycardia is described. The manner in which the drug acts in cases of this character is discussed.

Clinical evidence is presented which lends support to the theory that the action of quinidin in abolishing circus movement is not conditioned by the type of cardiac lesion, degree of decompensation, duration of fibrillation, &c., but is essentially related to the pathologic physiology of the auricular muscle.

The most important contribution of quinidin to clinical cardiology is that it provides a means by which the rôle of auricular fibrillation in myocardial failure may be quantitatively estimated.

Quinidin is universally a heart muscle poison. In each patient an estimate of this effect must be carefully weighed against the expectation of benefit to be derived from restoration of normal sinus mechanism. Indications for the use of digitalis and quinidin are entirely separate and clearly defined.

The effect of restored normal cardiac mechanism on compensation is illustrated by presentation of cases.

Electrocardiograms made before and after resumption of normal rhythm are analysed.

Treatment of Hookworm Disease with Carbon Tetrachloride (W. G. Smillie and S. B. Pessoa, *American Journal of Hygiene*, vol. iii, No. 1, January, 1923).—Carbon tetrachloride, administered in 3 c.c. doses to adults, is an extremely efficient drug in the removal of hookworm (*Necator americanus*). A single treatment will remove more than 95 per cent. of all hookworms harboured. Larger doses than 3 c.c. are unnecessary and may be dangerous.

Carbon tetrachloride has a toxic action upon the host, similar to that of chloroform. The first stages are dizziness, slight nausea, headache and somnolence. These are usually transient. A later and more serious manifestation is fatty generation of the liver, which first manifests itself two or three days after treat-

ment. This condition rarely occurs, and is seldom fatal.

There is a wide variation in individual reaction to carbon tetrachloride. Large doses, 10 to 20 c.c., have been given to adults without producing apparent ill-effects. Alcoholics are especially susceptible to the toxic action of the drug; so small a dose as 1½ c.c. has produced toxic symptoms in an acute alcoholic.

Field Experiments on Vertical Migration of Hookworm Larvæ (Florence King Payne, *American Journal of Hygiene*, vol. iii, No. 1, January, 1923).—A series of field experiments was carried out to test the ability of buried larvæ of *Necator americanus* to migrate from various depths to the surface.

Larvæ developed in large numbers from fæces buried at depths up to 36 in. in sandy-loam soil.

Larvæ migrated to the surface in large numbers from material buried at various depths up to 36 in. in sandy-loam soil. Migration was equally free whether the larvæ were buried after reaching maturity or fæces containing ova were buried.

The numbers of larvæ reaching the surface decreased as the depth of burial increased.

In the red clay, containing some sand, migration was quite successful from a depth of 10 in., but not to the same degree as in the sandy loam.

In a relatively pure clay migration from a depth of 6 in. was unsuccessful.

In an experiment to test the possibility of migration of larvæ out of a latrine pit very few larvæ were found above the level of inoculation.

Contributory Factors in Post-arsphenamin Dermatitis (John H. Stokes and Edward P. Cathcart, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923).—In the authors' experience it has been found that cutaneous reactions to arsphenamin in general are not a function of the amount of the drug administered; and that they show a distinct tendency to occur early in the course of its administration, rather than late.

Comparative and direct clinical analysis indicates that post-arsphenamin cutaneous reactions have no clinically demonstrable connection with the administration of mercury (except as an external irritant inunctions); neither do they seem dependent on any renal abnormality or injury detectable by the ordinary laboratory tests. In other words, no clinical evidence has been found that arsenic retention due to renal injury by mercury is a cause of arsphenamin dermatitis.

In a great proportion of cases, evidence was found that chronic focal and acute prodromal or intercurrent infections form a part of the complex on which arsphenamin cutaneous reactions develop. The severity of the cutaneous reactions observed has stood in a rough direct relation to the extent of the infection factor.

Serious and even fatal results associated with rapid extension and generalization of a previously mild

dermatitis have been found to follow the stirring up of a focus of infection.

The immediate involution of a severe and extending dermatitis on the total extirpation of a septic focus was witnessed in one case. This favourable outcome, however, is distinctly exceptional.

A variety of circumstantial evidence is based on studies of the prodromes, the systemic symptoms, epidemiologic considerations and fragmentary bacteriologic findings, which seem to render still more plausible the conception of infection as an important part of the causative background of the exanthematic and exfoliative syndromes complicating the administration of arsphenamin.

The authors propose a theory of the mechanism of post-arsphenamin dermatitis based on an allergic instability or idiosyncrasy produced either by colloidal changes secondary to arsphenamin, especially if accompanied by repeated reaction, or by chronic or sudden absorption of a bacterial sensitizing protein from a focal or acute infection as the fundamental premise. On this allergy, the vasodilator toxic action of arsenic, the possible vasodilator effect of an acute shortage of epinephrin from arsphenamin injury to the suprarenal, or the vasodilator and irritative local effect of mercurial inunctions or iodine, or of other local applications, and perhaps all of them at once, react. The increased amounts of bacterial protein antigen or arsenic as such, brought to these sites of vasodilation and irritation, still further excite the sensitized cells of the skin and other tissues to an acute inflammatory reaction. Injury to the liver from arsenic, from chronic or acute infection, or from repeated allergic shock due to a series of injections in a patient already somewhat hypersensitive, may assist in the development of tissues, or interfere with the natural defence against the protein toxins of chronic focal or acute infections.

It is believed that this view reconciles and combines several conflicting or partial theories and a variety of seemingly incongruous clinical facts.

The Correlation between Humidity and the Intensity of Hookworm Infection in Southern India (K. S. Mhaskar, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—Bearing in mind the possibility of the correlation between the intensity of the infection and humidity being a spurious one, it appears that the intensity of the infection, as represented by the number of hookworms harboured, is high during the period November, December and January, when humidity is at its maximum.

Bacillus mesentericus vulgaris in the Blood (Joannides, *La Grèce Médicale*, November-December, 1922).—Particulars are given of a case of appendicitis in a soldier 28 years of age, where a severe blood infection supervened and the causative organism was identified as *Bacillus mesentericus vulgaris*. Reference is also made to other recorded

cases which point to the fact that acute infection may be caused in particular circumstances by organisms which normally are saprophytic.

On the Question of the Role of Camels in the Epidemiology of Plague in Astrakan (S. M. Nikanorov, *Herald of Microbiology and Epidemiology*, 1922).—It has been definitely ascertained that camels are an important source of plague infection in man in the Kirgiz district. The method of infection of these animals under natural conditions has not yet been proved; but evidently ground squirrels are of importance in this connection, as they probably contaminate the green fodder. Mice are even a more probable source of danger, as by infecting the hay they create suitable conditions for disseminating the disease by inhalation, this form generally proving fatal.

Note on Iron Haematoxylin Staining (H. E. Shortt, *Indian Journal of Medical Research*, vol. x, No. 3, January, 1923).—The author describes a new method of staining which entirely does away with the old process of maturation formally necessary before the stain was ready for use. The procedure is as follows:—

To 95 c.c. of distilled water in a flask one adds 1 grm. of pure haematoxylin crystals (Grübler for preference). This solution is slowly brought to the boiling point, with occasional shaking to complete solution of the haematoxylin, and at this stage 5 c.c. of pure carbolic acid, liquefied if necessary, are added.

The solution is now allowed to cool and is then ready for use. Extensive trial, under varied conditions of temperature and climate, of solutions so prepared has shown that this stain is absolutely reliable in use, and the addition of the carbolic acid seems to increase the power of penetration, so that by following the usual technique an intense nuclear stain is obtained with unfailing regularity.

The Present Value of the Widal Reaction in the Inoculated Subject (A. G. Shera, *British Medical Journal*, December 2, 1922).—The author reports an acutely febrile case on which he performed a Widal reaction. Dreyer's macroscopical technique was used, and the result was strongly positive for typhoid. The patient had been inoculated for enteric during the war; he died a few days after the test. On post-mortem examination miliary tubercle was found to be the cause of death. It was then suggested that the positive Widal reaction might have been due to residual effects of war-time inoculation.

The agglutinin reactions to typhoid, paratyphoid A and paratyphoid B of five healthy ex-soldiers showed that 50 per cent. of the cases agglutinate typhoid up to 1 in 250.

Paratyphoid agglutinins are very slight in all cases as compared with typhoid residue. A posi-

tive Widal reaction in the inoculated subject is of no diagnostic value in typhoid fever, but in the non-inoculated the reaction is of great value.

Case of Trypanosomes (A. J. Mackenzie, M.B., *Annals of Tropical Medicine and Parasitology*, vol. xvi, No. 4, December, 1922).—The patient, a married European woman about 18 years of age, had in August, 1919, accompanied her husband on a shooting expedition in a tsetse-fly area in Sebungwe, S. Rhodesia. After she had been on the veldt six or seven weeks she became ill, and was taken to the nearest town and treated for malaria for three weeks. As at the end of this time her condition had not improved, she decided to return to her own home. On admission to hospital on October 31 she was evidently acutely ill, and had a temperature of 102° F. She complained of intense headache and severe pain all over the body. The spleen was slightly enlarged, and the posterior cervical glands were also slightly enlarged and tender on pressure. A blood smear taken on admission and stained with Giemsa showed a very severe trypanosome infection. The trypanosome appeared to be *Trypanosoma brucei* vel. *rhodesiense*. Posterior nuclear forms were found in the patient's blood. This diagnosis was confirmed by intra-peritoneal inoculation of the patient's blood into a rabbit. Treatment with galyol, soanin and tartar emetic had no effect, and the patient became gradually worse. Hyperæsthesia was a marked feature of the case from the outset. The slightest touch made her cry out with pain. Her mentality changed, and she became childish and played with dolls. About the middle of November she developed keratitis, which affected both eyes. This became worse, and in a fortnight she was almost completely blind. Emaciation was progressive throughout the illness. She gradually sank, and became comatose two days before her death, which occurred on December 9.

Abstracts and Reprints.

A POSSIBLE FALLACY IN THE "THICK FILM" METHOD OF EXAMINATION FOR MALARIAL PARASITES.¹

By Major J. A. SINTON.

FOR many years it has been pointed out that numerous fallacies may occur in microscopical diagnosis due to the accidental entrance of extraneous substances into the material being examined, either during its collection or during the process of preparation for examination. In this note another possible occasion of such error is pointed out.

In examining a large number of blood smears from

cases of treated malaria for evidence of parasitic relapse I was astonished to find on one day that, although all the "thin films" were negative, yet, most of the "thick films" showed forms which seemed "positive."

These results were surprising because a number of the "positive" cases were receiving 30 gr. of quinine daily and because the results were not in keeping with the previous findings.

The forms most commonly seen in these smears consisted of blue masses of protoplasm with a distinct, well-stained, red chromatin mass obviously a protozoan of some kind, but showing no signs of pigment.

These forms usually looked like half-grown benign tertian or quartan parasites, but did not show the amoeboid form seen in the former parasite when of the same size; the chromatin mass also seemed much more rounded and compact than that of the malarial parasite of apparently the same age. In addition, forms were found which very closely resembled the gametocytes of either of these two malarial parasites and some forms showed two nuclei rather resembling Leishman-Donovan bodies.

These forms were not very numerous and no "small ring" forms were found, but sometimes large bacteria and fungi with a superficial resemblance to crescents were seen.

The distilled water used to hæmolyse the films was examined to determine whether there was any possible source of error in the reagents employed in the technique and it was found to contain a number of ciliates and flagellates.

In order to find out whether these might be the cause of the appearances seen in the "thick films," blood from a known non-malarial person was examined by the same method and similar findings were obtained.

These "thick films" were prepared as follows: The films were allowed to dry in the air, then each was covered with distilled water to hæmolyse the red blood cells, the water was allowed to act for about five minutes, and, if necessary, was renewed during this period. The water was then run off and the slide allowed to drain. The smears while still wet were fixed in methyl alcohol and then stained with Giemsa's stain.

Apparently what happened was the protozoa, possibly attracted to the "thick films" for nutriment, became entangled in the loose meshes of the fibrin and were fixed there by the methyl alcohol, and stained in the later steps of the technique.

In the case of the thin films this did not occur, because the only time when distilled water was used as such, was in the final washing, when the protozoa would have little chance of becoming fixed to the film which has no loose masses of fibrin and when there was also no chance of those which adhered being stained.

The cause of this sudden appearance of these protozoa was traced to the fact that during the morning of the day in question all the fresh distilled water had been used up and while a fresh supply was

¹ Abstracted from the *Indian Journal of Medical Research*, vol. x, No. 2, October, 1922.

being prepared an old bottle of distilled water was used which had apparently become infested with these protozoa.

This fallacy might occur very easily during the hot weather in the tropics when there is a large amount of dust blowing about and when the temperature is also very favourable for the growth of such micro-organisms.

It would be very liable to happen in laboratories where little distilled water was being used and in which such water was kept in drop-bottles, which are always very likely to become contaminated.

It is therefore necessary that in examining the blood by the "thick film" method that freshly distilled water should be used and that all drop-bottles, &c., used to contain it should be cleaned every few days and rinsed out with absolute alcohol before refilling.

This fallacy might be liable to vitiate any results in which the "thick-film" method is used for searching for other blood protozoa, especially in the tropics, and might result in the "discovery" of a new species of parasitic protozoa in smears from the blood or internal organs.

THE TREATMENT OF HOOKWORM DISEASE BY CARBON TETRACHLORIDE.¹

By A. T. COOPER and A. J. VADALA.

REPORTS have previously been published of the results of the treatment of hookworm disease by single doses of carbon tetrachloride. Such a procedure, if efficacious, would be of great benefit at Fort Benning, Ga., in lessening the number of hospital days for the command.

All stools of patients admitted to the hospital are routinely examined for hookworm. Calculations previously made by one of the authors at the post of Fort McPherson, Ga., one year ago, seemed to indicate that 13 to 15 per cent. of the adult population of this section of the country are infected with hookworm; this was found to be true at the summer training camp at Camp McClellan, Ala.

The experience of Fort Benning has been that it takes, in the majority of instances, over two courses of thymol treatment to effectively cure a person of hookworm. While this treatment is in process the patient is hospitalized and the stools examined frequently until free of ova. The treatment if indicated by positive stools, is repeated in a week to ten days' time, not sooner because toxic symptoms may develop. Manifestly it would be an advantage, if it were possible, in treating hook-worm disease to have a vermifuge such that one or two doses would be sufficient, with no need for restricting the diet and hospitalization.

The reports available on the action of carbon tetrachloride seem to indicate that its action might at least be superior to that of thymol and that it

might be the equal or the superior of oil of chenopodium.

With this in view, 125 c.c. of carbon tetrachloride was secured from the Station hospital clinical laboratory, it being one of the reagents listed as laboratory supplies.

Carbon tetrachloride is a clear colourless fluid, having the formula CCl_4 ; specific gravity, 1.629; molecular weight, 153.8; non-volatile matter, 0.001 per cent.; blood pressure, 76°; free Cl_2 , none; it has a penetrating disagreeable odour reminding one of chloroform and sulphuretted hydrogen. Its taste is sharp and burning.

For the purpose of the administration of carbon tetrachloride, cases as a rule were selected for treatment who had not received previous treatment by other vermifuges.

In all cases showing presence of the ova in the stools, a second stool examination was made as a check for the first examination. To these, only one dose of 3 c.c. of the carbon tetrachloride was given. The drug was administered in soft gelatine capsules, each containing 1 c.c., and was given in the mornings preferably without breakfast. Later, as the effects of the drug on the patients were studied, it was found that it did not matter, therapeutically or symptomatically, at what time of day the drug was administered nor whether the patient had previously fasted.

Following the administration of the drug the patients experience very few symptoms (some none at all); the usual complaint is dizziness (this begins as a rule in a few minutes and lasts two to three hours), a sensation as if "drunk," a tingling and numbness in the extremities, a sensation of heat in the stomach, and drowsiness. The latter induces the patient to go to bed and "sleep it off," and when he wakes all discomfort as a rule has disappeared and no further complaint is made.

To determine the day stools of patients become hook-worm free, stools examinations were made every other day for ten days following the administration of the drug. Almost invariably the examination in all cases after forty-eight hours was negative for hookworm and has remained so ever since.

Further examinations were made every week for two months; these also have been negative.

For stool examinations, in order to obtain the largest possible number of positives, the faecal specimens are overlaid with a saturated aqueous solution of magnesium sulphate and a small amount of glycerine. This procedure brings the ova to the surface of the fluid in increased numbers which facilitate their transfer in numbers (if present) to the slide by means of a platinum loop.

For the purpose of comparison in the efficacy of carbon tetrachloride as compared with thymol and oil of chenopodium, cases previously treated with either of the latter two drugs, and which now showed two consecutive positive examinations for hookworm ova, were given 3 c.c. of carbon tetrachloride. This treatment resulted in negative stools after forty-eight hours and have remained negative since the treatment

¹ Abstracted from the *Military Surgeon*, vol. lii., No. 2, February, 1923.

(period, one month). One case that had been treated with thymol and oil of chenopodium, and which was still positive for hookworm ova, was given carbon tetrachloride with results similar to the other cases, i.e., cured.

For patients treated with thymol the average number of days spent in hospital was 12.5. Many of these patients required two or more courses of thymol medication.

Oil of chenopodium has also been used in treatment of hookworm disease at this hospital. The average number of days spent in hospital for each patient receiving chenopodium treatment was nine. Many of these patients also required two or more courses of treatment. The above treatments were given one week to ten days apart because toxic symptoms, i.e., headache, nausea, vertigo and gastro-intestinal irritation would develop if repeated earlier. In giving thymol or chenopodium it was necessary to purge and restrict the diet of the patient.

Although the number of cases treated thus far is not large, yet the consistent negative stools following only one administration of the carbon tetrachloride, and the persistence in negative findings for those cases treated as long as two months ago by carbon tetrachloride are sufficient to warrant faith in its use. In addition, there is the fact that patients need not undergo the previous discomfort of purgation and starvation. What is more important from the viewpoint of the army surgeon is the fact that these cases need not be hospitalized for treatment, and if hospitalized, then for no longer than forty-eight hours, in order to become hookworm free.

It is contemplated treating all cases of hookworm in this hospital with carbon tetrachloride. As far as we are able to determine at the present writing, the results obtained in this hospital with only one dose of the drug have been 100 per cent. cure.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE.
December 13, 1922.

A Saccharomyces, Pathogenic for the Guinea-pig, in a Human Lesion (M. Blanchard and G. Lefrou).—A *saccharomyces* was found in the pus of a large abscess situated in the right scapular-vertebral region of a patient at Brazzaville; the abscess is believed to be the outcome of a fall on the back about four years previous.

Inoculations of cultures into guinea-pigs caused tumefactions with sero-hæmorrhagic pus, and the same yeast was found as that inoculated. No Koch bacilli were present; the kidney, lungs and spleen were normal. Treatment with iodine was ineffective.

Pulmonary Mycosis (E. Marchoux).—The sputum of a patient suffering from general debility was hæmorrhagic, resembling the pus of an amebic abscess; no amebæ were present, but abundant

budding *saccharomyces* were found. It has not yet been determined to which species of fungus this organism belongs, but the parasitic elements in the sputum and its pathogenicity for guinea-pigs show it to be probably of a *Monilia* type.

Treatment with iodine had no effect upon the patient.

The Receptivity of Infants to Septicæmic Plague (C. Mathis).—The different opinions of many authors are given as to the age most susceptible to plague; but in the Plague of Marseilles (1720-1721), Mexico (1902-1903), Milan (1566-1568), and in the Plague of London (1665), neither children nor adults were spared.

The number of cases recorded of the epidemic in the Punjab (1906) shows a majority of adults; children under 5 years of age and old people were rarely affected.

The septicæmic form is the most frequent and is difficult to detect in children, as they generally die of convulsions and intestinal hæmorrhage without their temperature rising. Yersin bacilli are found on autopsy.

Treatment of Tropical Phagedenoma with Subcutaneous Injections of Novarsenobenzol (E. Tournier).—The author is of the opinion that novarsenobenzol is the most efficacious treatment of tropical phagedenoma, and gives proof of thirty-six cases cured by the following method:—

(a) An injection of 0.03 eg. of novarsenobenzol the first day, using a solution of 4 per cent. of sodium chloride as vehicle.

(b) Daily dressings of the wound with iodoform powder four or five times.

(c) After the complete disappearance of the fusospirochetes and of the false membrane, dressings with 1 per cent. picric ointment every other day, or with iodoform powder.

Inoculation of the Cat with Amæbæ of the Latex of Plants (G. Franchini).—The author succeeded in infecting two cats with eight to ten days culture of amæbæ found in the latex of certain Apocynaceæ. Abundant amæbæ, some containing red blood corpuscles, were found in the stools.

Concerning Malaria in Corsica (F. Regnault).—The author states that because the cattle of the poorer districts are badly nourished and exposed to all weather they have a thick skin which does not attract anophelæ.

M. Roubaud considers this to be incorrect, as the pig and buffalo are among the animals on which anophelæ have been found.

Endemic Index of Malaria in the town of Bamako (French Sudan).—The blood of 255 children, under the age of 10 years, all suffering from different apyretic affections, was examined during the months of May-September. 203 cases were found to contain parasites, and of these 197 were schizontes of *Plasmodium præcox*.

The parasites were of variable dimensions, and the double-caryosome forms were not rare. Only three cases of *P. malaria* were found.

In the investigations of Bouffard (1906-07) and A. Leger (1911-12) *P. malarie* was predominant.

Hæmogregarina: Forms found in a Case of Pernicious Autochthon Anæmia (F. Noë).—A new parasite, 19.4 microns long and 4.5 microns thick, was found in the blood taken from a vein and finger of an inhabitant of Paris, aged 59 years. Morphologically the parasite resembles *Hæmogregarina inexpectata*, but is different from the latter in various characters; the author has named it *Hæmogregarina gallicæ*. The blood picture resembled that of pernicious anæmia.

A Preliminary Note on a *Hæmogregarina* in Man (L. Nattan-Larrier).—A detailed report is given on a patient from the French Congo suffering from malaria, trypanosomiasis and hæmogregarinosis. Examination of the blood showed the presence of two trypanosomes and extra-cellular parasites resembling *Hæmogregarina elliptica*, for which the author proposes the name *Hæmogregarina equatorialis*.

Trypanosoma berberum of a Dromedary, preserved Four Years, by Passages through Guinea-pigs. The Increase of its Virulence (Edm. Sergeant and A. Deguillanne).—Experiments were carried out with a culture of *Trypanosoma berberum* on 111 guinea-pigs in four years in fifty-five passages. The animals were all of the same age and weight approximately; the quantity of virus inoculated was always the same. The virulence was greatest from the first to the eighteenth passage, two and a half years after inoculation of the first guinea-pig. It varied little from the nineteenth to the fifty-fifth passage, a period of one and a half years. In the first nineteen passages the average duration of survival was seventy-three days. The average survival in the other thirty-six passages was only eighteen days.

Lymphatic Porocephaliasis and Tuberculous Lymphadenoma of Rapid Development in a Senegalese (R. Pons and F. Noë).—On autopsy all the lymphatic glands were found to be enlarged, and a tumour (1.8 kg.) full of larvæ of *Porocephalus*, possibly *Armillifer armillatus*, was revealed.

The authors conclude that the parasite infection was 22-24 months old when the patient died, and that the very rapid spread of the tuberculosis was due to the breakdown of tissue caused by the parasite.

Note on the Geographical Distribution of *Bullinus* and *Planorbis* compared with the Geographical Distribution of Bilharziosis in Tunisia (Ch. W. Anderson).—*Planorbis* appear to be limited to the northern region of Tunisia, and the types met with are *Planorbis philippii* var. *subangulatus*, but no cases of bilharziosis (*Schistosoma mansoni*) existed.

On the contrary, *Bullinus* seem to be diffusely distributed, and their presence coincides with the existence of *S. hematobium*. The types of *Bullinus* found in Tunisia are: *B. contortus*, *B. brochii*, *B. dybowskii*.

A Case of Multiple superficial Tumours observed in the Cameroons (Jojot and Langret).—The patient, a native, presented with 493 malignant tumours; only six on the head. An excised tumour, examined histologically, showed the characteristics of a typical fusco-cellular sarcoma, with abnormal nuclei and neo-formed capillaries.

Concerning Tablets of Quinine Salts (Maurice Langeron).—Quinine tablets in the form of comfits have several advantages over tablets of lenticular shape; they are not bitter, are more solid, and are more readily accepted by patients; but they do not disaggregate so rapidly as the latter. In making tablets starch should be used in preference to any other agglutinant, as it is a powerful integrant.

Observations for Pernicious Malaria and Black-water Fever in Bengal (A. Ukil).—Pernicious malaria is prevalent in all parts of Bengal at all times of the year, but particularly during the months of November and December.

The comatose form is the most common; the parasites found were always *Plasmodium falciparum*; there were no cases of pulmonary or thoracic form.

Treatment by intramuscular injections of 1 gr. of quinine in dilute solutions every twelve to twenty-four hours gave good results. Intravenous injections of quinine, either with concentrated or diluted solution, should only be used in very grave cases.

Protozoa of different Muscides caught on Euphorbia Plants (G. Franchini).—After giving a detailed description of various flagellates and trypanosomes the author comes to the following conclusions:—

The presence of protozoa in the digestive tube of different flies found on Euphorbia is very frequent; some of the parasites have a true resemblance to the flagellates of Euphorbia, and many resemble free gregarina and spirochaetes.

Many species of flies eliminate the parasites by faeces which mix with the latex and penetrate into the plants.

The flagellates have been successfully cultivated in broth of latex of Euphorbia and in pure latex.

Second Contribution to the Study of Flies in relation to the Evolution of *Habronema equini* (E. Roubaud and J. Descazeaux).—The authors give a detailed account of their further researches, of which the results were already briefly given in the previous number. The developments of *Habronema megastomum* and of *H. musca* in the domestic fly and of *H. microstomum* in *Stomox* are described; the authors deny the existence of an encysted stage. The escape of larvæ of *Habronema* from an infected fly takes place through the proboscis, and is dependent upon the conditions of temperature and humidity of receiving surface being exactly suitable. While *Habronema* does not survive long on the human conjunctiva, it produces irritation and may provide a way for other infections. The infection of flies with *Habronema* takes

place in warm, moist weather; the effects on different varieties are described and the evolutionary relationship of *Habronema* and *Filaria* is considered.

The Elimination of Calcium and of Phosphorus in Lepers (A. Boulay and M. Leger).—In lepers of the black race phosphorus is eliminated for certain periods of time, followed by periods of retention.

As regards calcium the lepers can be divided into two groups. Sometimes there is *calcic retention*, time appearing to be eliminated as phosphate; sometimes there is *hypersecretion*, chiefly by the urine, part as phosphate and part in combination with some other acid. Apparently in the first stage of the disease there is calcium retention, while later there is an increase in the elimination of calcium salts.

Dakar and its Environs; Index of Malaria at Different Seasons (Leger, Bédier and Boulay).—The results of investigations made in the month of October are tabulated to show the numbers found to be infected at various ages, and the relative proportions due to *Plasmodium præcox*, *P. vivax* and *P. malariae* respectively. The results are also collated with those for the months of January and June. The majority of cases were due to *P. præcox*.

Considerations on the Morphology of Plasmodium præcox in Pernicious Malaria (M. Leger and E. Bédier).—The patient was a native 18 months old, suffering from pernicious malaria; he was cured by treatment with quinine. The hæmatological examination revealed an intense infection of *Plasmodium præcox* of atypic and ordinary forms. In a count of 556 red corpuscles 40 per cent. contained hæmatozoa.

Maurer's spots (Stephens and Christopher's stains, after Sergeant) are visible in certain parasitic cells. The percentage of characteristic annular schizonts is 72.5, amoeboid 9.5, bacilliform 4.0, schizonts in segmentation 8.5, compact elements 3.5, and doubtfuls 2.0. Of those in segmentation, 66 per cent. contained from ten to sixteen nuclei.

Clinical Observation of a Case of Pernicious Malaria studied from the Bacteriological Point of View. Posology of Quinine in Infants (M. Nogue).—A child about 22 months old suffering from severe fever and diarrhœa was successfully treated with intramuscular injections of quinine.

On examination of the blood 40 per cent. of the red corpuscles were found to contain parasites.

The author suggests a dose of grm. 0.05 to grm. 0.10 of quinine for every year of age of children suffering from pernicious malaria.

A Suspected Case of Creeping Causation (Pseudomyiasis) (A. Gambier).—The author describes a singular case of an infection in the Sudan of which the causative agent has not been determined.

The patient was used to going about with bare feet in open sandals. A slight red indurated œdema was perceived on the small toe of the left

foot; later a furrow 2 mm. wide gradually spread from the toe to the sole of the foot and up the leg. A month later another furrow, commencing from the toe, spread in the same manner from the instep. The patient was successfully treated with nitrate of silver.

Intestinal Parasitism in Senegal (M. Leger and M. Boulay).—From October 1 to November 1, 1922, the authors examined the faeces of over 1,000 Europeans and natives; some were affected with diarrhœa or dysentery, others showed no symptoms of intestinal trouble. A large number were infested with helminthic parasites, the percentage of ankylostomæ exceeding any other.

Measures for the Extirpation of Malaria from Dakar (Heckeworth).—The present unsatisfactory condition is due to the insufficiency of the works of sanitation undertaken, to negligence on the part of the population, and to lack of strict and continuous enforcement of regulations. The Commission recommend: The rapid execution of a sanitary programme, such as that established in 1920 in the Cape Verde Islands, correction of the defects in the works already instituted, improvements in storage of rain and of sea water, modifications of the regulations as to stagnant water, severe enforcement of legal penalties, prophylactic minimization of the infantile population from May 1 to November 1 each year.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 1, January, 1923.

Therapeutics of Antimony (R. N. Chopra).—The distribution of antimony in the tissues and its elimination have not been thoroughly worked out yet, but it has been pointed out that one-third of the amount injected is excreted by the kidneys in twenty-four hours, so that the danger of accumulation in the body does not seem very great when the organs are functioning properly. The possibility should, however, always be borne in mind. If heart, kidney, or lung disease exists antimony should be given with the utmost caution, and before starting a course of treatment these organs should be thoroughly examined or their functional state investigated. In weak, emaciated and anæmic subjects a small dose should be given in the beginning, and the increase should be very gradual.

A Malarial Survey of Sarantwadi State (C. Strickland).—In the main the observations made have proved that (1) the slightly undulating land of the State is only slightly malarious; (2) the villages lying along the spurs of the Deccan Ghat are intensely malarious; (3) and those lying in broken hilly ground distinct from the Ghat are only very slightly malarious.

Between the incidence of the disease on plain and hill one might expect to find some difference, but here is a distinction as between two sets of hills, those connected and those not connected with

the Ghat, although to all appearance the condition of each is the same, with their little patches of paddy and rocky hill-streams coursing down the sides of well-wooded hills.

The only explanation forthcoming is a suggestion hazarded by the author—the virulent malaria zone lies along the spurs of the Deccan, and these have above them the whole pressure of the subsoil water of this region; the consequence being that the filtrate seeps out all along the foothills, and admirable breeding places for anophelines, and particularly for the evil carrier *maculatus*, arise. The water which springs into the well on the top of Narendra Hill behind Sawantwadi town probably fell as rain on the Deccan.

On the other hand, the broken hilly tracts to the west have lying above them no such filter-bed from which the hill-foot springs replenish themselves; for instance, the broken hilly country to the south-west is connected with the rest of the State by land only 160 ft. above sea-level, consequently nowhere among these hills can there be a head of water derived from the Deccan plateau of more than 160 ft., and so very little water can arise there.

These tracts depend entirely on the local rainfall, and in this way a further reason for the different phenomena in the two zones exists, in that the rainfall in the western hilly tracts is much less than it is near the Ghat and the Deccan spurs, and fewer breeding places of surface water are provided. The explanation put forward then is simply hydro-dynamical.

The Use of a Non-motile Strain of Bacillus typhosus in the Agglutination Reaction (Gopi Pada Khan).—The author is of the opinion that it is essential that in the agglutination test undertaken for the diagnosis of enteric infections a non-motile strain of *Bacillus typhosus* be used in addition to the other organisms ordinarily used.

Case of Homicidal Yellow Oleander Poisoning (Sauranganath Bunerjee).—Information furnished by police revealed that the deceased, on taking a meal of stale rice and bean curry given him by his wife, with whom he was not on good terms, began to vomit, and died within two to three hours after taking his food in the evening. The deceased complained of unnatural pungency of taste of the bean curry immediately after taking it, and suspected foul play on the part of his wife. The following symptoms appeared before death:—

(1) The deceased felt a burning sensation like that produced by taking raw red chillies in the mouth soon after taking the bean curry.

(2) Loss of sensation in the tongue and pulling it inside.

(3) The deceased felt blindness of the eyes.

(4) Vomiting.

(5) Sense of extreme weakness.

(6) Unconsciousness.

The poison was administered through the bean curry from two packets afterwards discovered on the persons of the deceased's wife and aunt. These

packets were sent to the chemical examiner for analysis and were found to contain oleander.

Personal Observations on Cases of Kala-azar (D. N. Roy).—It is not at all safe to diagnose a case of fever to be malarial in origin merely from the history, the physical signs and reaction to quinine.

When the spleen does not disappear after the temperature comes down to normal, and remains so for some time, in spite of the patient taking quinine in solution in proper doses, the suspicion should at once arise that probably the fever is not malaria.

The enlargement of the spleen is most noticeable during the pyrexial period, when the consistency of the organ is more or less soft. During the afebrile time the spleen becomes hard.

If the temperature persists, especially a moderate evening rise after the remittent stage, and if the spleen remains enlarged to the same extent as it was during the remittent period, the case is probably one of kala-azar.

Medical News.

PLAGUE.

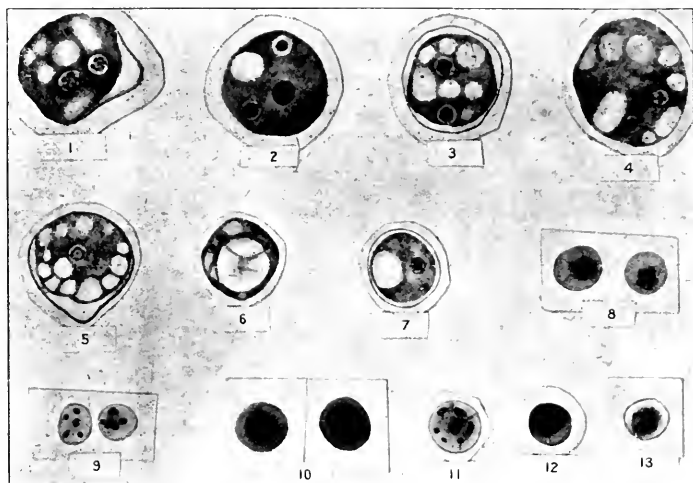
THE usual spring recrudescence of plague is at hand, according to news issued from Simla on April 7, 1922. The disease is especially virulent in the United Provinces, the Punjab, the Central Provinces, and the Bombay Presidency. Bengal is declared free from the epidemic, and only a very few cases are recorded from Calcutta. The death-rate amongst plague patients is stated to be in a higher proportion to those attacked than usual.

Influenza-like Bacilli isolated from Cats (T. M. Rivers and S. Bayne-Jones. *Journal of Experimental Medicine*, vol. xxxvii, No. 2, February, 1923).—Six strains of Gram-negative non-motile bacilli from cats have been described. They do not grow on ordinary media. They do grow, however, on a medium to which an autoclave-labile substance alone has been added as an accessory growth factor. These bacilli are similar to *Bacillus para-influenzae* isolated from man. One strain of a Gram-negative non-motile bacillus more exacting than *Bacillus influenzae* in its food requirements was found and for convenience has been placed for the present in the para-influenza group.

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A. Robertson, del.].

To illustrate paper on "*Dientamoeba fragilis*, Jepps and Dobell, 1917. A Case of Human Infection in England," by J. G. THOMSON, M.A., M.B., Ch.B., and ANDREW ROBERTSON, M.B., Ch.B.

All the specimens illustrated were drawn with the camera lucida from preparations fixed in Schaudinn's solution and stained with Heidenhain's iron hæmatoxylin. Nos. 1 to 7 were drawn at a magnification of approximately 2,200 diameters, Nos. 8 to 13 at a magnification of approximately 4,000 diameters.

Nos. 1 to 4 show typical binucleate individuals. No. 3 has a thin margin of clear ectoplasm round it.

No. 5.—This is a uninucleate individual, which

illustrates the differentiation between the ecto- and endoplasm.

No. 6.—A degenerate uninucleate amœba. Note the large vacuole and indeterminate nuclear structure.

No. 7.—A uninucleate amœba in an early stage of the degenerate process. The differentiation between the two layers of the cytoplasm is still distinct.

Nos. 8 to 10.—Nuclei from binucleate *Dientamoeba*.

Nos. 11 to 13.—Nuclei from uninucleate *Dientamoeba*.

Original Communications.

DIENTAMÆBA FRAGILIS, JEPPI AND DOBELL, 1917. A CASE OF HUMAN INFECTION IN ENGLAND.

By J. G. THOMSON, M.A., M.B., Ch.B.,

Director of Protozoology, London School of Tropical Medicine,
AND

ANDREW ROBERTSON, M.B., Ch.B.,

Assistant in Protozoology, London School of Tropical Medicine,
Grociers' Research Scholar.

This small amœba of the human intestine was first found in preparations of human fæces by Wenyon in 1909, but, unfortunately, a description of the parasite was not published. In 1917 Jepps and Dobell described seven cases in which *Dientamæba fragilis* had appeared in the stools. Since then, so far as can be made out, there have been no further cases noted.

The patient, in whose stools the *Dientamæba* were found, is a man aged 38. He has been resident in London since 1919, previous to which he was stationed abroad. Other than a diarrhoeic attack in 1919 at Singapore, which cleared up after an *Ascaris lumbricoides* had been evacuated, there was no history of bowel disorder. Since his return to this country in 1919 specimens of the stool have been examined from time to time, but with negative results as regards the finding of protozoa. In January of this year he had a slight diarrhoeic attack associated with some form of food poisoning, and in the fluid motion the *Dientamæba* were found. The stool was passed into a clean Petri dish, thereby avoiding any possibility of contamination with urine or with material adventitiously present in the receptacle, and, what is of the greatest importance, it was submitted for examination within a few minutes of being passed. This latter point is worthy of considerable emphasis, since the rapidity with which degeneration and disintegration of this amœba take place is very marked. Jepps and Dobell in their original description laid stress on this feature; indeed, their choice of the specific name depended on the fragile nature of the organism, and its inability to support for any length of time the adverse conditions existing outside the body. These authors also adduced this lack of persistence in a recognizable form as a possible reason for the rareness with which this parasite has been found in human stools.

Only three stools in all have been available for study. The first, as noted above, was a fluid, diarrhoeic motion; the second, received about a fortnight after the first, was formed, and had a few particles of thick, tenacious mucus on its surface; while the third was a soft, semi-solid stool. In the first stool there was, in addition to the *Dientamæba*, a heavy infection of *Entamæba coli*. A few ova of *Trichuris trichiura* were also present. In the second stool the *Dientamæba* were very hard to find, and, even though the specimens were prepared without loss of time, such as could be made out with

certainty were degenerate. The third stool showed the amœbæ in recognizable numbers. A heavy infection with *Blastocystis hominis* persisted throughout.

The *Dientamæba* in the present case showed the characters which have already been described by Jepps and Dobell. The only feature, if any, which shows some variation is the nuclear structure. In the fresh the nuclei are difficult to observe, but they can be made more easily visible by treating the specimens with Gram's iodine. However, to properly study the nuclear characters well stained preparations are essential, and, of all the methods adopted, Heidenhain's iron hæmatoxylin gave the most satisfactory results. Each nucleus is spherical and vesicular, and the achromatic nuclear membrane is very thin and difficult to make out. Immediately within this delimiting membrane is a clear zone, so far as could be seen free of chromatin but crossed by a few fine threads, probably of linin, radiating outwards from the centre of the nucleus. Jepps and Dobell, in their original description, stated that all the chromatin was situated in a fairly large, central karyosome, which appeared to be made up of a number of chromatin granules apparently embedded in a plastin matrix. On the other hand, all the individuals studied in this case showed in optical section several chromatin granules, more frequently four or five in number, less frequently six or more, arranged in the form of an irregular circle or ring at a distance between the nuclear membrane and the centre, which varied with each nucleus. In no instance were these granules actually on the nuclear membrane, nor was it impossible, except in specimens which had not been thoroughly differentiated, to make out a clearer area within this ring, even when the granules were closer approximated towards the centre. In the central clear area a dot or granule could usually be made out, but this did not give the same staining reactions as the chromatin, nor did it have the same clear-cut outline. The chromatin granules were not constant in size or shape; the commonest outline seemed to be oval or slightly bean-shaped.

With regard to the cytoplasm the differentiation between the ectoplasm and the endoplasm, which is so marked a feature in the fresh, is frequently retained in stained films, and, as many of the *Dientamæba* become almost spherical in the fixation process, this results at first sight in an appearance suggestive of a cystic structure, the clear ectoplasm forming a narrow and more or less regular ring round the granular endoplasm. The granular inclusions in the endoplasm are most curious, stain most intensely, but are too small to allow of their characters being made out with certainty.

The majority of the *Dientamæba* were binucleate, and the uninucleate forms worked out at just under 20 per cent. of the total. This approximates very closely to the 20·3 per cent. of uninucleate forms in the cases of Jepps and Dobell. No dividing nuclei were seen, but several binucleate individuals

were found which appeared to be undergoing multiplication by fission into two fairly equal parts, each of which contained one of the nuclei.

No cysts of this parasite have been found. Indeed, the manner in which it is propagated from one host to another is a most difficult problem to decide. It does not seem likely that an infection can be acquired by the ingestion of the adult amœba, as its life outside the body is a very short one indeed, nor does it seem probable that, even if swallowed while still alive, it could survive the vicissitudes of its journey through the alimentary tract till it reached its intestinal nidus.

As Jepps and Dobell emphasized the way *D. fragilis* degenerates is most characteristic. As a rule one of the existing vacuoles increases in size until it occupies the greater area of the body, having round it merely a ring of cytoplasm in which the nuclei can be made out. Thereafter disintegration of the remainder is very rapid.

The authors desire to express their thanks to Dr. C. M. Wenyon for his courtesy in allowing them to compare the specimens in this case with those prepared by him in 1909, and to Dr. Duncan for giving them access to the material.

REFERENCE.

JEPPS, W. M., and DOBELL, C. (1918). "*Dientamœba fragilis* n.g., n.sp., a new intestinal amœba from man." *Parasitology*, x, p. 352.

EDUCATION IN ITS RELATION TO THE PHYSICAL AND MENTAL DEVELOPMENT OF EUROPEAN CHILDREN OF SCHOOL AGE IN KENYA.

By MURDOCH MACKINNON, M.D. Edin., D.P.H. Oxon., Nairobi.

THE study of children in health and disease is to me a subject of absorbing interest. The influence of abnormal conditions and environment on their general health and development, their reaction physically to climatic and other elements to which by nature they have not been fitted, are subjects on which a great deal of research has been done and much written, but opinions differ as to the ultimate effects or even the mode in which deleterious effects, if any, are produced. Apart from the influence of known tropical diseases on their general health much remains to be done in the study of the effect of sun rays in the equatorial regions, such as Kenya, more especially when such conditions are modified by high altitudes varying from 5,000 to 6,000 ft. above sea level.

The natural habitat of the white races is in those regions of the earth where the climate is temperate, that is in zones where the cold of winter is followed by the warmth of spring and summer in regular sequence without extremes of either heat or cold.

Removed from their natural environment, whether it be the animal or vegetable kingdom, certain changes necessarily develop and influence their growth and propagation. These changes may be manifest in

increased growth and energy due to the warmth and light of the tropical sun and is analogous to the enhanced and rapid growth of plants reared in hot-houses under conditions which, as far as heat and soil are concerned, approach as near as possible to tropical climate.

On the other hand, tropical conditions may have deleterious effects, so much so that certain plants and animals may wither and decay under the stress of elements to which they have not been accustomed, and against which they are unable to develop any resistance. The effect of a change from natural environment may be for good or ill according to the inherent power of resistance of that species of plant or animal to abnormal influences.

The emigration of European races to tropical countries is an ever flowing stream. Whatever influences tropical conditions may have nothing will stop this migration, and the probabilities are that as the population increases in the temperate zones and the struggle for existence becomes more severe, increasing numbers of European races will migrate to the tropics and carry on their existence there in spite of adverse circumstances.

It is, therefore, of economic and imperial interest to study the effects on the human system of these abnormal conditions in order to arrive at a true estimate of the suitability of a tropical country for European colonization.

A study of the health of children born and reared in a tropical country is a fairly accurate line for investigation, and when comparison is made with children of a similar age brought up in a temperate climate one can reasonably form some opinion, though not conclusive, of the part played by climatic influences in producing changes in the human system.

Kenya colony is unique in one respect, in that, as far as I know, it is about the only country on the equator where European settlement is encouraged, or even attempted to any extent.

There must be few, if any, countries in the world with such vast latent possibilities in many directions waiting to be exploited and developed, and a climate, though essentially equatorial, greatly modified by the high altitude at which Europeans live.

Herein lies the danger that in the glamour of the many advantages the country possesses one might overlook the great disadvantages associated with the tropics from the point of view of its becoming a permanent settlement for a white population.

The question of adaptation or acclimatization is a very complex one, and what may apply to one tropical country does not necessarily follow is applicable to all. The prevalence and severity of tropical diseases account very largely for the incidence of ill-health among Europeans, but most tropical diseases are preventable by improved methods of sanitation, and the advance of scientific knowledge, but until the eradication or diminution of the diseases peculiar to a tropical climate is accomplished incapacity from illness must vary according to the prevalence of these diseases.

The general impression with regard to the bearing of children in the tropics is that they are stunted in

growth, anæmic and less robust than children brought up in a temperate climate. This may be true as far as India and other tropical countries are concerned, but from the study of upwards of 500 children born and reared in the Highlands of Kenya, the general physique is on the average much above that of children at home. For the last seven years I have been interested in the question, and in the European school in Nairobi I have endeavoured as far as possible to collect statistics relative to the stature and weight of school children between the ages of 6 and 17.

The height and weight of boys and girls at different ages are taken, and from the number collected so far an interesting comparison can be made with the average height and weight of European children of English speaking races in other parts of the world.

The number collected is, of course, small, and the comparison may not be considered fair, but it is at any rate as accurate as can be from the statistics available. From the diagram shown it will be at

Between the age of 6 and 10 boys are heavier than girls, with the exception of age 7 when girls are heavier and taller. The average annual increase in weight for boys is 4.6 lb. and for girls 4.7 lb. Between the ages of 11 and 15, however, the girls put on weight more rapidly, and are heavier than the boys, the annual increase in these years being 7.7 lb. for boys and 7.9 lb. for girls. After 15 years boys again gain the lead in weight.

Comparing this chart with that of English children it will be noticed that though English children are not so heavy, there is a steady annual increase, and between the ages of 12 and 15 years the girls are heavier than boys, coinciding with what occurs in this country. After the age of 15 boys are again heavier than girls. (See Diagram II.)

What can be the explanation of this difference in stature and weight as compared to children at home? There can be little doubt that the warmth and light have a stimulating effect on growth, but I think that food also plays an important part in the general

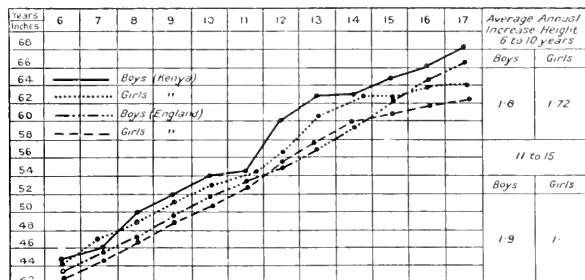


DIAGRAM I.—Showing Average Annual Increase in Height of Children in Kenya and England.

noticed that in regard to height children of both sexes are a good deal taller at all ages than children at home. There is an annual increase in height of 1.8 in. in boys and 1.7 in girls between the ages of 6 and 10 years, and between 11 and 15 years the boys increase a stature at the annual rate of 1.9 and the girls 1.7 in.

Boys are taller than girls at all ages, except at the age of 7 when girls appear on the average to be taller than boys. Comparing the chart with that of children of English-speaking races, it will be seen that the latter are not only below the height of children here, but also the annual increase of stature is more steady, and does not increase at a greater rate in quinquennial periods as it seems to me in this country. Boys are taller than girls up to the age of 11 years and after 14 years. Between the ages of 11 to 14 English boys appear to be shorter than girls, but at 15 years boys are again taller than girls. From the age of 15 years onwards they behave similarly, boys being taller than girls. (See Diagram I.)

WEIGHTS.

The weight charts are equally interesting, as children at all ages in this country appear to be much heavier than the average at home.

physical development. The general impression is that metabolism is low and appetite poor in a tropical country, but that cannot be said of children in this country. The diet at the school is very liberal both in quantity and quality. Of recent years more importance is given to foods that are known to be rich in vitamins, and diet has to be so varied in quality as to assure that none of the three known vitamins are deficient. From the diet sheet at the school, I think there can be no danger of a deficiency in that respect, as the quantity and variety are abundant.

It is generally supposed that during exercise and hard work when metabolism is high the amount of protein necessary is relatively greater than the carbohydrate in order that tissue waste may be balanced.

The theory is advanced that acclimatization is best accomplished by adapting oneself to the diet common to the indigenous races, but as this mainly consists of vegetarian food it follows that animal protein so necessary to the repair of tissue is wanting, and the result is a deficiency in resisting power and a lack of reserve force owing to protein starvation. The three main constituents of food are protein, carbohydrate and fat, the last two being utilized for the produc-

tion of heat and energy and the protein for tissue repairing.

Assuming that in warm climates the production of heat is not so necessary as it is in cold climates, it follows that the quantity of fat consumed should be less. The body, however, exercises its influence by increased evaporation from the skin and lungs, and so the temperature is maintained at an even rate however much fat is consumed.

Carbohydrates are the great protein spacers, and any excess consumed is reserved in the body in the form of fat.

The amount of proteids necessary for the repair of tissue metabolism is less than it is in cold climates where the muscular tissue is exerted to a greater extent.

The following is approximately the quantity of each variety of food consumed by a child in twenty-four hours, and, estimating each in terms of calories, the total caloric value of the food for a young child is

and is only approximate and liable to much variation. It is, however, of value in showing how liberal the school diet is, and proves that the children's appetite is good.

THE NERVOUS SYSTEM.

The nervous system is the governor of all the other systems of the body. Just as heat and light stimulate growth and energy for a time, so the nervous system is also stimulated to increased function. When the process of stimulation is prolonged and continuous there comes a reaction which manifests itself by a feeling of exhaustion and mental lethargy at the end of a day's work. This is the common experience of Europeans of all ages and both sexes, especially those engaged in work requiring some mental effort and concentration.

In children, however, the effects are somewhat different to that in adults. Children who have been born in the country, or who come to the country at

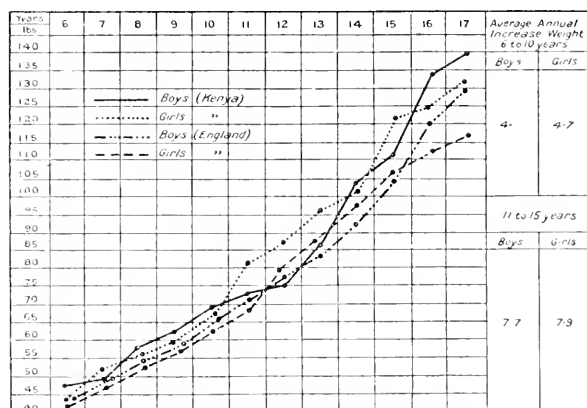


DIAGRAM II.—Showing Average Annual Increase in Weight of Children in Kenya and England

over 3,000, or equal to what is considered necessary for a hard working man in a cold or temperate climate.

Food	Quantity in 24 hours	Caloric value
Sugar	3 oz.	345
Bread	11 "	770
Milk	1 pint	400
Cream	1 oz.	126
Meat	6 "	558
Jam	1 "	98
Vegetables, potatoes	8 "	200
Butter	1 1/2 "	313
Flour	3 "	300
Cereals	2 "	180
Eggs (1)	2 "	70
Fish	1 1/2 "	20
Fruits	2 "	56
		3,456

The energy value of the above foods is calculated from a table in Hutchison's book on food and dietetics

an early age, develop a degree of mental alertness far superior to that of children of a similar age in a temperate climate. Just as there is some precocity in physical growth so there is also a greater development of the intellectual centres, which, however, is only temporary, as after the age of ten years a gradual process of mental exhaustion and deterioration sets in. The period coincides with the rapid increase in height and weight at that age.

For convenience one can arbitrarily divide the mental faculties of a child under three headings:

(1) The power of reception, (2) the power of retention, (3) the power of application.

(1) *Power of Reception.*—Under the power of reception one may include the senses of hearing, sight, touch, smell, &c., all of which are essential to a complete understanding. With these senses well developed the child can interpret what he is taught, and with a mind ready by constant stimulation he is

le to receive the knowledge and impress it on his mind. The child's mental faculties develop at an earlier age and are more receptive. It is very noticeable how quickly and with what accuracy a young child who knows simple addition can count long line of double figures, and also the rapidity of his answers to questions in mental arithmetic.

(2) *Power of Retention.*—By this is meant the capacity of the brain to retain what the child receives and interprets by his senses, so that when the occasion demands he can apply his knowledge. One of the most striking effects of tropical climates on the nervous system of both child and adult is to impair memory. The power of retaining knowledge, which the child readily enough acquires, is markedly defective, with the result that at the beginning of each school term an almost complete revision of subjects taught during the preceding term has to be gone through before the child can make much progress.

(3) *Power of Application.*—In this memory is of the greatest importance. The child is not capable of expressing himself in connected thought and speech and he cannot satisfactorily apply the knowledge gained on account of the action of heat and light, integrating as it were the impressions formed on the brain. The result is that the child cannot apply his knowledge on demand. The results of a test examination at the end of a school term are generally speaking not good.

It is significant to note that mental alertness is extremely good up to the age of 10 years. Girls at that age appear on the whole smarter than boys and after that age they both begin to deteriorate, girls more rapidly than boys.

Children who have left school before the age of 12 years and have gone home to continue their studies here, I believe, done extremely well, but those who remain in the country after that age to finish their education suffer from mental exhaustion and inability to pursue their studies to the extent of qualifying for the higher examinations, such as the London matriculation or the Cambridge Junior examination. Very few indeed of the children who remain in the country have been successful in these examinations. Four children who have left school to continue their studies at home have done extremely well, as the following record shows:—

- (1) One boy, aged 10, returned to the Edinburgh Academy and passed into a class above pupils of his own age.
- (2) Boy, aged 12, at a college in South Africa, came out top of the school in mathematics.
- (3) Boy, aged 12, at Sutton Coombe, Devonshire, spoken very highly of by his masters.
- (4) Boy, aged 16, passed London Matriculation direct from the school.

Forgetfulness is common to Europeans in all tropical countries. In 1913 Sir Havelock Charles, in an address to the Society of Tropical Medicine, discussed what he described as the Punjab head in hand, which is characterized by forgetfulness, impatience of temper, and disinclination to work.

In a number of cases, according to Sir Havelock

Charles, tropical diseases may be held primarily responsible for the condition, but in many instances he considers climate alone is at the root of the evil. Others with experience of tropical countries believe that neither climate nor the diseases of warm climates are alone responsible, but that the altered conditions and habits of a tropical life play an important part in the production of mental lassitude.

Children, however, who have been born and reared in the country, and have never experienced any conditions other than those associated with a tropical country, show well-marked nervous effects, whether they have suffered from tropical diseases or not. One cannot help feeling, therefore, that climate is the main cause of the mental deterioration, and that the effects are aggravated if the individual is in poor condition of health, such as follows in any of the tropical diseases.

I do not think that the altitude at which we live has any injurious effects on children: on the contrary I believe that it is beneficial, in that the lungs expand, the red corpuscles increase, and though the oxygen tension is somewhat lower, the defect is made up by a slightly increased rate of respiration.

EDUCATION.

In this country the system of education is on much the same lines as it is in England. That must necessarily be so if the aim is to educate the child so that if he so desires he can pass for admission to English public schools or universities. The curriculum for the senior pupils is of a high standard, and the masters and mistresses in charge are very highly trained men and women (most of whom are university graduates). The whole is under charge of a Director of Education of very high qualifications and experience.

The age of admission to the boarding school is 7 years, but my own impression is that children should start kindergarten school between 5 and 6 years of age, as my experience of young children is that their brains are more receptive and developed at that age than children of a similar age at home. I would mention here that the ideal to aim at should be boarding schools only. The discipline and training of a boarding school under the direct supervision of the masters and mistresses, the regularity in meals, play, exercise and sleep, leave an impression on the young mind which is of the greatest importance in the child's future career.

In a young colony such as Kenya, where a white population is being encouraged to settle and build up businesses and homes, the question of the education of the rising generation is of the utmost importance. In view, however, of the experience gained so far, and the impression one forms, one cannot help expressing the opinion that if the rising generation is to be fitted to their career in life, whether in commerce, science, agriculture, or professional calling, the whole system of education in this country will have to be reviewed, and rather than build expensive secondary schools the Government should encourage by scholarship and other monetary aids, the sending of children home after the age of 10 to complete their studies in English schools.

It must be admitted that the building in which the children are being taught in this country is utterly unsuitable for the purpose. It is composed of wood and iron, and the temperature in the class rooms during the dry hot season is so high that it is quite impossible to expect children to concentrate their attention, or for the teacher to impart knowledge with a lucidity and clearness so essential to the teaching of children. They both suffer from mental inertia to such a degree that their time is wasted in the endeavour, and great harm is done to the children in consequence. This appeared so obvious in the afternoon that recently I have induced the director of education to change the hours of teaching. The school hours now are from 8.15 a.m. to 1 p.m., and I understand that the teachers are unanimous in their opinion that more and better work is being done. The fact remains, however, that warm climates are not conducive to that amount of study which is essential to the development of the mind in all its aspects.

Cold and temperate climates have always been the stimulus to concentration and the application of mental energy, and it is futile to expect children brought up and educated in a country such as Kenya to compete on equal terms with others who have been reared and educated in a more congenial climate.

The conclusion one is forced to come to in the study of children in this country is that the earlier years of life, from the ages of 6 to 10 years, are benefited by the stimulating effects of the sun, both in physique and mental vigour, but after the age of 10 a general process of exhaustion becomes apparent, and if a child is to continue his studies for secondary or university education it is absolutely essential that he should be taken to a temperate climate to do so.

I am quite convinced that whenever possible all children after the age of 10 years should be sent home to complete their education.

Kindergarten and elementary schools only should be provided in this country, and no encouragement should be given to secondary education, except to those whose circumstances are such that they are unable to send their children home.

If that were an established rule I have no doubt that the stimulating effects of the sun's rays on mental development in early life would, while these children continued their studies in a temperate climate, be an aid in the development of brilliant intellectual characteristics, which might remain dormant or deteriorate from exhaustion in a tropical country.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 1, 1923.

THE DISPENSING OF COCAINE AND SOME OTHER DRUGS.

It is surely time that the medical profession raised its voice in protest against the manner in which it is being dealt with by the authorities—whatever they

Treatment of Yaws by Sulpharsenol (H. Coppin, *Bull. Soc. Med. Chirurg.*, vol. xii, December, 1921).—A case of yaws appearing in a child of 6 is described. The patient entered hospital after three months' duration of the disease. A month after admission and after three injections of sulpharsenol an eruption of herpes zoster appeared. It is suggested that this was a complication of yaws, but it may have been due to the arsenic.

y be—concerning the sale of cocaine, opium in many forms and alcohol.

Cocaine is the chief mote in the forefront of these the recent experience of the writer. During the last week the writer had occasion to request perally at a well-known pharmacy for tablets and tabloids of cocaine for immediate hypodermic under urgent circumstances. The patient had been suffering from hæmorrhage from the bowel since August, 1922, until April, 1923. The patient is only at times aware that he passed blood at stool, and as there was no pain, no pile observable, and the man was anxious to go on with his work as a foreman in a large commercial house in the City of London—he neither consulted a doctor nor rested in consequence of his ailment, which he took no serious notice of. Months passed, and it was only when a doctor saw his stools that he was compelled to take treatment. In March, 1923, the stools were found almost non-fæcal, frequent, and consisted of fresh fluid blood and a small quantity of mucus. His doctor took him to see a specialist who had had experience in the tropics, who put it down to amæbic dysentery, and gave emetine hypodermically. If anything the disease advanced whilst under emetine, the man in his enthusiasm owing to his daily work in the City. On the advice of "his own" doctor the patient saw another consultant, who had further investigation made and had the stools examined at two of the best known laboratories. At these no abnormal factor except the *Bacillus proteus* was found—no *B. amæba*, no *B. dysenteriae*, no cysts. No vermes or their eggs were found, except the *Proteus*, which is not looked upon as other than a "harmless" factor and could not account for the hæmorrhage; nor did the sigmoidoscope show any abnormality in the lower 10 inches of the bowel. The patient showed improvement under a multiplicity of treatments, including "horse serum," bovine and "equine serum," &c. Late in the treatment an abscess developed at one side of the anus, which without incision was found to contain pus. The patient was so induced that a general anæsthetic was considered unsafe and cocaine was suggested, and it was in the search for this drug that the experience about to be recited took place. The pus was found so pronounced that immediate opening was found imperative. In the nursing home no cocaine was available, and the surgeon himself went to a long-established pharmacy in the neighbourhood and asked for cocaine hypodermic tabloids or tablets. "I am sorry I cannot supply you." The presentation of the surgeon's card made no difference, the cocaine still being refused. The nursing home at which the patient was being treated and the chemist's shop were in the midst of the West End nursing homes. At last the chemist had to confess that he had to give up dispensing cocaine, to even medical men, owing to the trouble it caused, and although he knew the surgeon quite well personally, he could not and would not supply the drug, but instead referred him to a chemist over a half-mile distant. There was nothing for it but for the surgeon to go

elsewhere. Starting on his search the surgeon went to another chemist's and renewed his request at a largely advertised shop (with many branches) within 100 yards of the Marylebone Road, London. Here a stolid-faced shop assistant met the surgeon with a refusal, and said they could not supply it; the presentation of the surgeon's card made no difference, the excuse being that another doctor would have to guarantee that the surgeon who presented the card was the name mentioned on the card. A third dispensary was visited, but the chemist, owing to having been fined £25 a day or two previously by a magistrate, was loth to risk supplying the drug, although the surgeon's card and his name in the Directory were confirmed.

Various questions are centred around this tale which requires elucidation. Two of the chemists told the surgeon that his name and the surgeon himself were known quite well to them, and said, "You are So-and-So, are you not?" the reply being in the affirmative. "Well, we are very sorry, but we have been so pestered by the authorities that we prefer to exclude cocaine from our stock of drugs." The third said, "Yes, we keep it for the use of medical men, but not being familiar with your appearance, we cannot accept the presentation of your card nor your name in the Directory that you are the man you profess to be." So yet a third time a refusal was made. The official inspector had been round calling at all three chemists' shops within a week; whilst at various magistrates' Courts a number of people had been "had up" for being in possession of cocaine. The front door was being watched carefully, whilst the back door was left open. The thief and the smuggler were readily found admission, whilst the honest man was being watched. The patient was deprived of treatment by officialdom; whilst the doctor's character was being slighted and taxes charged him to maintain a watch on harmless and honest men instead of upon back-door thieves and dishonest dealers. A double set of officials to be paid and pensioned and Britain £8,000 million in debt, and for what? Because a few people of doubtful reputation indulged in a drug which at times proves detrimental.

Opium and its derivatives are likewise placed under a ban which deprives the doctor of the "gift of God to man," and yet the doctors have to submit to being harassed by the authorities and their names placed on the black list of practitioners because they combine a Dover's powder with, say, quinine, although the powder may be allowed if given by itself, but it must not be given along with any other legitimate remedy.

Alcohol is not an officially recognized drug, and spiritus vini gallici is an unofficial addition to a prescription. An egg-flip—mistura vini gallici—has been expunged from the Pharmacopœia; and the chemist if brandy or other alcohol has been ordered has to supply it out of his own household bottle. When will doctors be masters of their own profession instead of being subjected to State interference; and such interference by men who are the slaves of the ignorant and rejoice in nothing more

readily than crushing science, and in some countries of putting them to death because they are educated to a platform on a higher level than themselves?

The State is to blame. A State which permits unqualified doctors and chemists, under various names and subterfuges, to camouflage under such titles as osteopaths, bone-setters and Government labels to treat the public, whilst they issue diplomas to men who have spent years in close and expensive study and heavy fees which the State claims from them.

Are there no Gorgas type of men left to declare their minds and tell their Governments that they are masters in medicine?

The writer had an experience which in one way or another must have been encountered by every man who has practised in the tropics and has taken up residence and work in a British city. The dosage of quinine, for instance, seems at times to frighten the local chemist in its amount in many instances, and to such an extent that he may write a letter of remonstrance before making the prescription up. Anything over 5 gr. will often draw a mild remonstrance; and a dose of 20 gr. at a time may not be made up until he has actually interviewed the doctor himself. The war has cured most chemists in even country places of this dread, for it is notorious that the inexperienced tropical man has with a short experience of malaria "at the front," become bold to daredevilness in giving huge doses of as much as 60 to 80 gr. of quinine in the twenty-four hours.

The writer had a good deal of trouble concerning the treatment of a case of ankylostomiasis he had prescribed for in the north of London. With the doctor he met in consultation he called at the chemist's, showed him the prescription, explained it, and told him not to be afraid of the strength of the ingredients, as he had given it many, many times. All seemed smooth; but a telephone message from the doctor was sent to the writer saying that the chemist had absolutely refused to supply the medicine, and nothing he could say or do would induce him to change his mind. The writer again went some four miles to the shop, but neither written assurance nor acceptance of responsibility availed.

The prescription was the weaker of the two formulae for eucalyptus oil with chloroform and castor oil.

Eucalyptus oil	..	...	℥	xxv
Chloroform	..	...	℥	xxx
Castor oil	..	...	ad	3 xi

The dose of eucalyptus was said to be too much, and when that was smoothed over the chloroform was objected to, and the end was that he (the chemist) refused to dispense it at all.

Can a chemist refuse to supply pharmacopœial drugs he has in his possession on a doctor's orders when the doctor can produce his card and show his name in the Medical Register or in the Medical Directory? Can he prosecute a chemist for refus-

ing to supply him with what he wants? It is, to say the least of it, a slur on the doctor's character, and the legal aspect may surely become serious. Of course, to call pulv. ipecac. co. in powder or table a legitimate and non-poisonous drug, but if, say, quinine is added to it, it is labelled poisonous, is, of course, a piece of dictatorial officialdom worthy of a Bolshevik and not of a civilized Briton, and his powers ought to be inquired into. One wonders does this state of affairs exist in Overseas dominions. In the Crown Colonies no doubt it holds good, for the people are deprived of political votes the moment they set foot in the colony.

J. CASTLE.

May 1, 1923.

Annotations.

Dengue Fever in Louisiana (L. C. Scott, *Journal of the American Medical Association*, vol. lxxx, No. 6, February, 1923).—Comparing the general course of dengue fever in Louisiana with the standard textbook description of that disease, the following conclusions seem justified:—

With one exception the syndrome as observed by the physicians in general throughout the State conforms very closely to the clinical entity called dengue fever. More or less deviation from the type in many instances does not in any way modify the conclusion.

An exception occurred in the remarkably frequent recurrence of gastro-intestinal symptoms, notably hæmatemesis, regardless of the source of the blood and of melena.

While the fact that a few of the practitioners regarded the cases as an atypical form of yellow fever is worthy of consideration, it does not warrant the acceptance of this view; the verification of such a hypothesis would demand experimental evidence.

The insect known as *Aedes ægypti* and commonly called the "tiger," "yellow fever," "house," "little day" or "calico" and *Stegomyia* mosquito was the principal if not the sole vector of the disease, and its widespread distribution constitutes an ever-present menace, which would be acutely appreciated should one or more recognized cases of yellow fever be introduced into the State.

The principal causes of the decline and cessation of the epidemic were the sudden change to colder weather which halted mosquito breeding, and screening, including protection of patients by mosquito netting, or both. It is possible that sanitation and destruction of mosquito breeding places around homes played a rôle.

Finally, the death-rate from dengue itself had been nil, though in a complication of other diseases dengue may have materially hastened the outcome.

The Prevalence of Hookworm and other Intestinal Nematodes in Adult Filipinos (Benjamin Schwartz and M. A. Tubangui, *Journal of Parasitology*, vol. ix, No. 2, December, 1922).—The majority of norma

adult Filipinos (approximately 85 per cent.) are infested with one or more intestinal roundworms.

Approximately 50 per cent. are infested with hookworm, but the vast majority so lightly parasitized, as judged by the scarcity of ova in faeces, that direct smears may fail to reveal evidence of infestation.

Both species of hookworm commonly parasitic to man apparently occur in the native population of the Philippines.

Filipinos appear to be resistant to hookworm infection and do not appear to show, as a general rule, clinical symptoms of hookworm disease.

Whether a racial immunity is involved in this resistance or whether purely physical and other conditions unfavourable to the life of hookworm eggs and larvae in the soil are responsible for the light infections still remains to be determined.

Ascariis and whipworm are commonly associated with hookworm, the degree and incidence of *Trichuris* infection corresponding to those of hookworm infection. While *Ascaris* appears to be less common in adults than the above-mentioned species it is generally present in greater numbers than the other species of intestinal nematodes mentioned in this paper.

The prevailing notions concerning the lightness of hookworm infestation and the absence of clinical symptoms in Filipinos harbouring these parasites, though supported by a considerable amount of data, should be confirmed by further investigations before the lack of medical importance that is now attributed to hookworm infections in the native population is accepted as an established fact.

Edema associated with Moderate Bicarbonate Administration during Convalescence from pneumonia (C. A. Binger, A. B. Hastings, and J. M. Neill, *Archives of Internal Medicine*, vol. xxi, No. 1, January, 1923).—The case studied was one of lobar pneumonia, in which an average of 57 gm. sodium bicarbonate had been given for a period of thirty-five days prior to admission to the hospital. The patient showed intense cyanosis with marked oxygen unsaturation of the arterial blood, rapid breathing, anasarca and hydrothorax, and evidence of alkalosis (blood Ph 7.55). Oxygen therapy largely relieved cyanosis and dyspnoea. Immediately thereafter the patient began to excrete retained base and water.

Whether this was more than a coincident relationship and just what rôle the salt free diet played in dehydration it is unable to state. Diminution of oedema was accompanied by gradually increasing lung volume and return to normal type of respiration. No definite impairment of kidney function could be established other than shown by a slightly reduced phthalein excretion. At the time of discharge from the hospital, the patient's blood oxygen, carbon dioxide content, and Ph were normal, the urine Ph was normal, and the urine was free from albumin and casts. The case is reported to show that definite untoward results may follow the administration of sodium bicarbonate, and to point out the character of certain untoward results.

A Cytological Study of the Nature of Rickettsia in Rocky Mountain Spotted Fever (F. M. Nicholson, *Journal of Experimental Medicine*, vol. xxxvii, No. 2, February 1923).—The *Rickettsia* of Rocky Mountain spotted fever were easily differentiated from mitochondria, phagocytosed blood pigment, nuclear debris, and all other known cellular constituents. Although they were lodged within the cytoplasm of endothelial cells, they were not observed to establish any definite relations with the nucleus or with other cellular components. Their number varied in contiguous cells which sustained the same degree of injury as evidenced by nuclear changes, and alterations in their mitochondria content. The mitochondria, on the other hand, showed similar modifications, characterized by a decrease in its number and a rounding up into spherules, in all the endothelial cells seen in a section of an affected blood-vessel. Diplobacillary forms were most abundant in the early stages of the reaction and single bacillary bodies towards its termination. Other slight differences in morphology from Wolbach's account were noted in the organisms as seen in the tissues of both ticks and guinea-pigs. His study of the distribution of specific lesions with accompanying organisms in the tissues of guinea-pigs was confirmed and extended.

Climate in the Treatment of Pulmonary Tuberculosis (H. Schwatt, *New York Medical Journal*, vol. cxvii, No. 1, January, 1923).—There is no specific climate for the treatment of pulmonary tuberculosis; no one climate is suitable for all cases of the disease and it is becoming more and more consensus of trustworthy opinion that tuberculosis can be successfully treated anywhere under a proper regime of rest, fresh air, diet and time.

There is no conclusive evidence to lead one to believe that high altitude is of a specific influence in the disease.

On the contrary, the great majority of the tuberculous, and particularly those in the advanced stages, are harmfully influenced by altitudes above from 1,000 to 2,000 ft.

Indigent consumptives, especially those in the advanced stages of the disease, should not be sent to high and distant climates.

It is important that these points become of more common knowledge among physicians and the laity.

Observations and Reflections on the Aetiology of Pellagra (J. W. Jobling and Lloyd Arnold, *Journal of the American Medical Association*, vol. lxxx, No. 6, February, 1923).—The observations made by the authors will not allow that in all cases of pellagra there was an insufficient amount of animal protein in the diet previous to the onset of the disease; but it is believed that the individuals observed probably consumed an excess of carbohydrates, and, for this reason, the idea is advanced. Those conversant with the diet of people living in the Southern States must have been impressed with the excessive amount of carbohydrates consumed, and this appears to hold

true for the warmer countries throughout the world. This does not mean that these people do not obtain a sufficient amount of animal protein.

Changes in Virulence of Tubercle Bacilli (Edward R. Baldwin, M.D., *New York State Journal of Medicine*, November, 1922).—Experiments on reinfection in tuberculosis carried on during the last four years at the Saranac laboratory show very considerable variations in the virulence of different strains. A culture (R.I.) of human bacilli thirty years old is now only slightly pathogenic, and a culture (H.37) isolated seventeen years ago is still quite pathogenic. Bovine tubercle bacilli B1 twenty years old is still very virulent for rabbits. Further investigation is suggested concerning the experiments by Kolle, Schlossberger and Pfannenstiel on the production of pathogenic strains from the bacilli of timothy-grass, butter and reptiles, by three passages through guinea-pigs and white mice.

A standard procedure is suggested for the determination of the virulence of different cultures of tubercle bacilli. It may be possible to correlate different clinical forms of tuberculosis with variations in strains of bacilli.

Specific Treatment of Hay Fever during the Attack (Warren T. Vaughan, *Journal of the American Medical Association*, vol. lxxx, No. 4, January, 1923).—In three cases of autumnal hay fever with sensitization to short ragweed, the patient had been desensitized by the routine commonly followed, both parenteral injection and nasal instillation being employed. One patient developed hay fever in a very severe form, while two were decidedly improved but not symptom-free after the onset of the pollen season. In all three cases symptoms cleared up almost entirely following daily subcutaneous injections of small amounts of ragweed pollen extract.

A fourth patient, a boy who had developed hay fever for the first time and had had no preventive inoculations, did equally well following daily subcutaneous treatment. The frequency of inoculations was gradually reduced in this case, the patient remaining greatly improved.

A similar case is reported with sensitization to corn pollen.

If it may be assumed, from the present meagre knowledge of the immunology of this disease, that relief of symptoms following preventive inoculation is due to an increased tolerance (as in morphinism) rather than a true immunization, and that the condition resulting is one of so-called anti-anaphylaxis, the daily administration of small amounts would appear to be a more logical procedure than the giving of larger amounts at much longer intervals.

During the pollen season the nasal mucosa is bearing the brunt of the allergic reaction. The administration of pollen elsewhere, as through the skin, would theoretically distribute the reaction

throughout the other tissues, thereby relieving to some extent the intensity of the local reaction.

In the method of treatment suggested, those patients who have not been improved by prophylactic treatment may become either greatly improved or symptom-free by continuation of the treatment during the pollen season.

According to the method proposed, patients presenting themselves for the first time during the pollen season, and without previous treatment, may be treated by specific measures.

The Long Time Cycles of Pandemic Influenza (Otto R. Eichel, *American Statistical Association*, December, 1922).—Pandemic influenza is identical with the influenza of the inter-pandemic periods; it is an intensely virulent and highly communicable form of the same disease. The disease may differ in clinical or pathological manifestations in various outbreaks.

Influenza exists constantly in mild or severe form in one or more countries of the world, or subdivisions of them; and factors, at present unknown, occasionally operate to increase the virulence and communicability of the disease, thus causing either epidemics or pandemics. (This condition becomes apparent when the influenza mortality of Britain is studied in comparison with the historic epidemics.)

There is increasing severity and frequency of local outbreaks in one or more countries for several years preceding the first invasion of a pandemic epoch; these preliminary attacks seem to begin after a series of years entirely free from epidemics, and may be susceptible of sanitary recognition, not statistical demonstration.

The appearance of influenza in pandemic form is evidence of the presence of a pandemic epoch, during which period of years one or more other epidemics or pandemics will occur at intervals of a few months to a year.

The rise and fall of the pandemic epochs in long time cycles indicates that the fundamental causative factors probably have been uninfluenced by preventive measures.

The Antiscorbutic Vitamine in some Oriental Fruits and Vegetables (Hartley Embrey, *Philippine Journal of Science*, vol. xxii, No. 1, January, 1923). All of the control guinea-pigs died of acute scurvy in from nineteen to twenty-one days.

Of the foods examined, pomelo, cucumber, chieco, and guava afforded the best protection from scurvy. In each case 10 gm. of the food given daily were sufficient to protect the animals from scurvy for a period of nine weeks.

The experiment with lansomes had to be terminated after four weeks, because this fruit disappeared from the Manila markets, being no longer in season. A careful inspection of the lansomes growth curves shows a steadily decreasing weight,

so that 10 grm. were evidently insufficient as a protection from scurvy.

Fifteen grm. each of kangkong leaves and of camote leaves daily gave protection for a period of from seven to nine weeks.

Betanaphthol in the treatment of Hookworm Disease (C. N. Leach and G. E. Hampton, *Journal of the American Medical Association*, vol. lxxx, No. 1, January, 1923).—The 397 prisoners examined by the authors were fairly representative of the island of Ceylon, since they came from all nine provinces. The infestation rate, as shown by microscopical examination of the stools, is 93.7 per cent.

The severity of infestation is well illustrated by the hæmoglobin findings and worm count. The average worm count from fifty-four prisoners was found to be only eight. The average hæmoglobin from 75 prisoners was found to be 73.2 per cent.

Betanaphthol, as an anthelmintic, administered in one portion without purge preceding or following, has produced "microscopic cures" in only 31.6 per cent. of cases after one treatment. After a second dose, following an eight-day interval, it has produced "microscopic cures" in 38.1 per cent. of those cases remaining positive after the first treatment.

Although the microscope shows 69.8 per cent. of cures for *Ascaris* after the first treatment with betanaphthol, and a further 31.2 per cent. cure with the second dose, none of the stools examined for helminths showed *Ascaris*.

With the dose as used in this prison (50, 60 and 75 gr. of powdered betanaphthol) administered in one portion on an empty stomach and without purge, not a single patient experienced any untoward effects.

Investigations concerning the Treatment of Amœbic Dysentery (A. W. Sellards and Lamberto Leiva, *Philippine Journal of Science*, vol. xxii, No. 1, January, 1923).—Three species, representing three genera of the Simarubaceæ, were tested for their efficacy in treating amœbic dysentery in man—namely, *Harrisonia perforata* (Blanco) Merrill, *Brucea amarissima* (Loureiro) Merrill, and *Castela nicholsoni* Hooker.

Harrisonia perforata was not especially toxic for animals; it was readily taken by patients, but was inefficacious against amœbæ.

Brucea amarissima was very toxic for animals, produced nausea readily in patients when taken by mouth, and its action on amœbæ was of little value.

Castela nicholsoni possesses a distinctly toxic principle, therapeutic doses are well borne by patients, and in five cases it gave prompt relief of symptoms, accompanied by the disappearance of the amœbæ.

After an interval of several months four of the cases treated with *Castela* were re-examined. A relapse occurred in one patient; two others remained perfectly well, but cysts of *Entamoeba*

histolytica were found in the stool of one; in the fourth no symptoms have appeared, and the stool was negative microscopically on two examinations.

This work, taken in conjunction with previous experience, suggests that *Castela nicholsoni* compares very favourably with emetine, both in immediate and in final effects of treatment. The administration of *Castela* can be effected very simply. Neither *Castela nicholsoni*, nor emetine, as employed at present, is an ideal agent for the eradication of *E. histolytica* infections in man.

Immunity Studies of Rocky Mountain Spotted Fever (Hideyo Noguchi, *Journal of Experimental Medicine*, vol. xxxvii, No. 3, March, 1923).—A potent immune serum against the virus of Rocky Mountain spotted fever can be produced in the rabbit.

By early administration of such an immune serum the virus introduced into the guinea-pig can be prevented from multiplying and causing fatal infection. When given within the period of incubation the suppression of the infection is assured, but after the onset of the disease the serum has no beneficial effect.

In view of the comparative susceptibility of man and the guinea-pig, it is recommended that in every instance when the bite of a tick gives reason to suspect a possible infection with spotted fever, or when a person accidentally inoculates himself with the virus, about 0.2 c.c. of the serum per kilo of body-weight (or 0.1 c.c. per pound) be injected immediately, preferably intravenously. For the average adult about 16 c.c. should be given.

The Effects of Subcutaneous Injections of Vaccines of Bacterium pneumosintes in Man (Peter Olitsky and Frederick Gates, *Journal of Experimental Medicine*, vol. xxxvii, No. 4, April, 1923).—Thirteen volunteers were injected subcutaneously with a vaccine prepared from two strains of *Bacterium pneumosintes*. Three doses were given corresponding, by opacity tests, to 1,000, 2,000 and 3,000 million staphylococci. The intervals between the several injections were five and eight days. Local reactions of mild and transitory character only were noted. Constitutional reactions, also mild and transitory, consisting of headache, depression and generalized muscular pains, were infrequently observed. None of the men were prevented by the vaccine from pursuing their ordinary duties. The vaccinations induce a transitory leucocytosis, and lead to the appearance of specific agglutinins in the blood serum.

The Effect of Stasis on the Development of Amœbic Dysentery in the Cat (A. W. Sellards and Lamberto Leiva, *Philippine Journal of Science*, vol. xxii, No. 3, January, 1923).—A laparotomy was performed on three cats under general anæsthesia,

and a ligature placed around the large bowel in order to produce stasis in its upper end. A suspension of *Entamoeba histolytica* was inoculated into the caecum. All three animals developed lesions above the ligature.

This experiment elucidates one factor in explaining (a) the usual occurrence of the initial lesions of amebic dysentery in the cat in the lowermost portion of the large bowel; (b) the superiority of intracæcal inoculations over injections per rectum for ensuring infection with amœbæ; and (c) the occasional failure of virulent amœbæ to infect susceptible kittens.

Stasis is probably an important factor in determining the location of the lesions within the large bowel in spontaneous amebic dysentery in man.

The Mechanism of Bacteriostasis (John W. Churchman, *Journal of Experimental Medicine*, vol. xxxvii, No. 4, April, 1923).—Between Gram-positive and Gram-negative organisms gentian violet exhibits the same type of selective activity, whether the dye be added to the media on which the bacteria are planted unstained (extrinsic bacteriostasis), or the organisms be stained with it before planting on plain agar (intrinsic bacteriostasis). In both instances the Gram-positives are inhibited and the Gram-negatives unaffected.

Between Gram-positive spore-bearing aerobes and the commoner Gram-negative bacteria, acid fuchsin, related sulfonic substances, and the flavines exhibit one type of selective activity when the dye is added to the media (extrinsic bacteriostasis), and the opposite type when it is added directly to the bacteria (intrinsic bacteriostasis). In the former case, the Gram-positive spore-bearers are inhibited and the Gram-negatives unaffected; in the latter case the Gram-negatives are inhibited and the Gram-positive spore-bearers unaffected.

Selective bacteriostasis is not necessarily conditioned by selective penetrability. Stained organisms may grow, and dyes which do not stain well may inhibit reproduction.

There is evidence that the phenomena of bacteriostasis may be due to changes effected by the dye at the surface of the organisms.

Cause of Anæmia in Ankylostomiasis (P. C. Flu, *Tijdschr. v. Vergleichende Geneesk. enz.*, vol. vii, No. 1, January, 1923).—The author is of the opinion that small but repeated hæmorrhages caused by the worms are the cause of anæmia in ankylostomiasis. The suggestion is based upon the presence of an anti-coagulant in the anterior part of the worm, and the absence of hæmolytic or hæmotoxic substances in the watery extract of the anterior part of the adult worm.

Rectal Administration of Tartarated Antimony in Bilharziasis (H. F. Wilson, *British Medical*

Journal, p. 137, January, 1922).—The author is of the opinion that intrarectal administrations of tartarated antimony are as satisfactory in the treatment of bilharziasis as intravenous injections; they take less time and are free from risk. Fewer cases of nausea and vomiting occur. 35 gr. was given to one case in five days without any symptoms of intolerance appearing. The drug was administered in 1 or 2 oz. of warm water per rectum through a funnel with a No. 12 rubber worm catheter attached.

Treatment of Oxyuriasis (W. T. Schmidt, *Munch. med. Wochenschr.*, No. 11, March, 1922).—Aluminium subacetate is recommended as a powerful anthelmintic, which is perfectly harmless to the patient. It is advisable to administer first a dose of calomel in order to stir up the parasites in the depth of the intestinal wall. The dose for an adult is 1 gm. three times daily on three successive days; 0.5 gm. for children, and 0.5 gm. twice daily for infants.

Treatment of Yaws by "Bi 36" (Van Den Branden, *Bruxelles Méd.*, No. 20, August, 1922).—The author describes three cases of yaws which were treated with intramuscular injections of "Bi 36," a bismuth preparation of Belgian manufacture. The injections were well tolerated, and the lesions rapidly disappeared.

Carbon Tetrachloride in Hookworm Disease (G. C. Lake, *Public Health Reports*, vol. xxxvii, No. 19, May, 1922).—The administration of large doses of carbon tetrachloride in cases of hookworm occurring in monkeys showed that no untoward symptoms appeared when the drug was administered by a stomach pump. The drug should be given in hard gelatine capsules to prevent inhalation; a purgative is not necessary, as this drug tends to increase peristalsis. The doses were from ten to forty times the dose per kilo of body-weight for man, and were repeated twelve to sixteen times. In two animals which were killed later no signs of macroscopic or microscopic lesions of the viscera were observed.

Abstracts and Reprints.

TULAREMIA FRANCIS 1921.¹

By EDWARD FRANCIS.

TULAREMIA is a specific infectious disease due to *Bacterium tularense* and is transmitted from rodents to man by the bite of an infected blood-sucking insect

¹ Hygienic Laboratory, U.S. Public Health Service Bulletin, No. 130.

or by the handling and dissecting of infected rodents by market men or laboratory workers.

As observed in Utah in the months of June, July and August, the disease is initiated by the bite of an insect, most probably the blood-sucking fly, *Chrysops discalis*, which previously has bitten a jack rabbit infected with *B. tularensis*. Following the fly bite on some exposed surface of the body (neck, face, hands or legs), the onset is sudden, with pains and fever; the patient is prostrated and is confined to bed; the lymph glands which drain the bitten area become tender, inflamed and swollen, and commonly suppurate, requiring incision. The fever is of a septic type, lasting from three to six weeks, and convalescence is slow.

Probably two dozen cases occurred in Millard County, Utah, in each of the years 1917, 1918, 1919, and 1920. The first case known to have terminated fatally was reported by the writer in 1919. The chief interest in tularemia as a disease in man arises from the disability which accompanies the illness; a disabling illness which overtakes the farmer in the busy season of midsummer, causing two or three months of sickness in the harvest season, is a serious matter.

Tularemia is a disease of the rural population, particularly attacking persons who work in the field. It occurs during the seasonal prevalence of the fly (*C. discalis*) in a community where jack rabbits are dying from an epizootic of plaguelike disease of rodentism. The reservoir of infection is in the sick and dying jack rabbits.

Case I.—R. S., male, aged 52, farmer; residence seven miles south-east of Delta, Utah.

July 23, 1919: Patient was taken sick while mowing alfalfa; went to bed with fever, pains in head, neck, and right shoulder; wife saw a small sore on right side of neck posteriorly, but paid very little attention to it; patient remained in bed from this date until death.

July 26: Temperature was 101° F. at 3 p.m. During the night of July 26 was sleepless on account of pain in head and right side of neck.

July 27: Temperature normal at 1 p.m. A sore on right side of neck, posteriorly, showed a black centre $\frac{1}{8}$ in. in diameter and surrounded by a yellow zone $\frac{1}{4}$ in. wide, which probably resulted from a fly bite, although patient did not recall having been bitten. Behind the right ear was a very tender and somewhat swollen area. No enlargement of axillary glands or of glands of left side of neck. Drew 65 c.c. of blood from median basilic vein for inoculation of animals.

July 28: Temperature at noon, 100.5° F.

July 30: Temperature at noon, 99.8° F. The appearance of the bite unchanged. Right cervical glands palpable; size of peas. Over the right mastoid, a swelling which fluctuates and is very tender and painful.

August 1: Temperature 99° F. at 10 a.m., 101° F. at 6 p.m. Pain in neck has been severe during past two days. Some pus has exuded from the site of the bite. Glands palpable. Swelling over mastoid very tender.

August 2: Temperature, a.m., 99° F.; p.m., 101° F.; pulse, 65. The black centre of the bite has sloughed out and a few drops of pus exuded. A very tender swollen gland is palpable. Complaints of great pain beneath the outer end of the right clavicle.

August 3: Temperature, a.m., 100°; p.m., 101°.

August 4: Temperature, a.m., 99°; p.m., 98.6°.

August 5: Temperature, a.m., 99°; p.m., 100°.

August 6: Temperature, a.m., 99.2°; p.m., 100°. Opened the abscess over the mastoid and got about 2 c.c. of pus, which was injected into animals. Drew 20 c.c. of blood from left median basilic vein, which was used for animal inoculations. Much pain in neck; patient said he had chills yesterday.

August 7: Temperature, p.m., 101.6° F.

August 8: Temperature, noon, 93.6° F. The bite is the side of a hole which is exuding a little pus.

August 18: Terminated fatally.

Case II.—C. F., male; aged 30; resident of Meadows, Utah, nine miles south-west of Fillmore. Patient of Dr. John E. Fuhrer.

July 21, 1920: First noticed glandular swelling under the right ear. The bite is apparent on the posterior surface of the right ear; did not know he was bitten at the time.

August 7: Incised post-auricular gland on the right side, from which some bloody pus was obtained for the inoculation of laboratory animals.

The duration of illness was about six weeks; ended in recovery.

Case III.—Jackson, female, aged seven years, resident of Hinckley, Utah.

September 9, 1920: Patient came to doctor's office with a bubo of the right inguinal region, which was fluctuating. By incision there was readily obtained some pus, which was used for the inoculation of laboratory animals. The site of the bite was on the posterior surface of the lower third of the right thigh, on that bare area so commonly seen above the stocking when a small girl bends forward; the bite had the appearance of a punched-out ulcer about a quarter of an inch in diameter. Patient recovered.

The coexistence in the same locality of tularemia in man and in jack rabbits was proved by the writer in June, July and August, 1920, in Millard County, Utah. During this period, *B. tularensis* was isolated from seventeen jack rabbits and six human cases.

A survey of jack rabbits for evidence of tularemia was conducted throughout a stretch of irrigated farming country sixty miles in length, extending from Sugarville, Utah, which is approximately thirty-five miles north-west of Delta, to Fillmore, which is approximately twenty-five miles south-east of Delta. This survey began on May 28, at Sugarville, and ended on June 18, at Fillmore. A total of 556 jack rabbits were shot and immediately dissected on the ground, examination being directed to their lymph glands, spleen, and liver. When the spleen and liver were considered suspicious, specimens were taken to the laboratory and rubbed on the abraded skin of the abdomen of a guinea-pig; and in case of death of the guinea-pig with typical lesions, cultures were made from the spleen and liver of the guinea-pig. Twenty-

three jack rabbits were found sufficiently suspicious by gross examination in the field to warrant inoculation of guinea-pigs with their spleens and liver. Of these twenty-three jack rabbits, seventeen were proved to be infected with *B. tularensis* in the laboratory by subinoculation in animals and by cultures; three jack rabbits which failed of confirmation in the laboratory were found dead in the field, and it is presumed that their infection had died before they reached the laboratory.

The jack rabbit survey which ended on June 18, outlined the district of most heavily infected jack rabbits and located it west of Holden. At this time no human cases had yet been reported for 1920, although it developed a few days later that two cases had had their onset on June 16, and that they lived west of Holden. The third and fourth cases of the season developed on June 23 and June 27; both worked west of Holden. All four cases occurred in the heart of the jack rabbit-infested country, five miles west of Holden, where, on June 16, we located five infected jack rabbits and twenty-six jack rabbit carcasses.

During this jack rabbit survey 277 ground squirrels (*Citellus mollis*) were shot. These animals were immediately dissected on the ground for evidence of tularemia. The livers and spleens of three were considered suspicious by gross examination and were brought to the laboratory for confirmation by guinea-pig inoculations and cultures. One, which was shot on June 2, 1 mile west of Abrahams, and had a typical spleen, proved positive, i.e., the spleen was rubbed on the abraded skin of a guinea-pig and inoculated subcutaneously into another guinea-pig; both pigs died with typical lesions of tularemia, from which a culture of *B. tularensis* was obtained. The other two squirrels failed of confirmation in the laboratory

carried out by the author, of direct transfusion (four to five minutes) of blood infected with *Trypanosoma congolense-pecorum*, followed by immediate injection of 1 gm. of emetin, showed the presence of trypanosomes in the blood of healthy bovidæ seven to nine days after transfusion.

A Malign Tumour in a Baluba Nigger (A. Dubois).—The patient was suffering from a subcutaneous tumour extending from the frontal region to the middle of the sagittal line. Cerebral hernia set in, and the patient died about two months later.

On microscopic examination the tumour was found to be a typical carcinoma of metastatic origin.

Mechanism of the Propagation of Trypanosomiasis by Stomoxys (René Van Saeckhem).—After several experiments the author has come to the following conclusions:—

Trypanosomes are found in the pharynx, and probably also in the cavity of the mouth in the stomoxys, not in the anterior part of the proboscis. The trypanosomes are killed by the saliva, but are kept alive when the pharynx contains blood. Infection by stomoxys (in the absence of *Glossina*) is slow and depends upon the flies being collected together.

Some New Observations on the Habits of Glossina tabaniformis, West (J. Schwetz).—The *Glossina* studied by the author were caught mostly on the trunks of trees in the River Kwilu district, and some in the daytime while in the act of biting.

Tabaniformis are more numerous at the beginning of the dry season than during the rainy season. They are 1-1, 5-2-2, 5 metres from the ground, and their usual position is head downwards.

Secondary Syphilitic Rash localized to Tattoo Marks (A. Dubois).—A native woman under mercurial treatment for secondary syphilis at an early stage, returned after an absence of thirty-seven days with a strong secondary rash limited clearly to the positions of old tattoo marks. It cleared up under further treatment with novarsenobenzol.

Report on the Medical Service of Urundi, February-December, 1921 (G. Mattlet).—Malaria is one of the commonest affections prevalent in Urundi among Europeans and natives. The rapid change in temperature and the climate in general cause numerous diseases of the respiratory system, also pulmonary mycosis and tuberculosis. Cases of intestinal fever, probably due to *Faecalis alcaligenes*, are often met with among natives. Lumbri-cosis is very frequent in children. Yaws in its worst form is very common; in some places 90 per cent. of the natives are affected. Strong doses of arsenic seem to be the only remedy, but patients often die of complications. Syphilis is rare, but almost every inhabitant is affected with *Tania saginata*. There are also many cases of helminthiasis and dental trouble.

Note on a Case of Basal Tuberculous Meningitis in a Negro, with Formation of a Tubercle in the

Current Literature.

ANNALES DE LA SOCIÉTÉ BELGE DE MÉDECINE TROPICALE.

Tom. II, December, 1922.

A Case of Phagedenic Ulceration of the Face (R. Van Nitsen).—The lesion began in the mucosa of the upper lip, caused by decay of the first two incisors; it spread rapidly to the gums, and necrosed the whole of the lip, the nasal bones and cartilage and cheeks. On the eighth day the patient died.

Microscopic examination revealed the presence of numerous fuso-bacilli and spiræchætes, such as are found in tropical phagedænia, but treatment in this case with neosalvarsan had no effect. Clinically the infection resembles *Espundia*, but differs in its rapid evolution and the absence of *Leishmania tropica*.

Note on the Treatment of Animal Trypanosomes by Emetin (René Van Saeckhem).—Experiments,

Cerebellum (Fornara).—A boy (Bangala) entered the hospital at Boma complaining of frontal headache, bone pains and general feebleness. Before death he complained of diplopia and developed opisthotonus. On autopsy meningitis of the base was found and a yellowish spherical nodule (1 cm. diameter) in the median line of the cerebellum, extending into both lateral hemispheres, and surrounded by a reddish oedematous zone. It was a typical tubercle with caseating centre surrounded by lymphoid cells, interspersed with giant cells. There were a few Koch bacilli. The floor of the fourth ventricle showed fresh tubercles. The bulbar arachnoid was infiltrated with lymphocytes.

Three Cases of Bilharziosis treated by Emetin (Trolli).—The patients had been unsuccessfully treated for chronic cystitis for two to three years. Microscopic examination showed the presence of numerous miracidium and eggs of bilharzia in the urine in each case. Gradually increased injections of emetin from 0.06 cg. cured the patients in a few weeks.

A Case presenting the Symptoms of Acute Articular Rheumatism, Refractory to the usual Treatments, and Cured by Emetin (Trolli).—An Italian skin dealer, after ten and a half years' residence in Kigoma without any illness, suddenly felt severe pains in the arm joints and leg, which rapidly spread to the shoulder. He had fever with excessive perspiration. After being unsuccessfully treated with salicylate aspirins, iodine, colloidal sulphur and mercury, he was cured by injections of emetin.

Observations on Human Trypanosomiasis (J. David).—A native of the Belgian Congo suffering from *Trypanosomiasis gambiensi* was treated unsuccessfully for a year with atoxyl, soamin, emetin, neosalvarsan, trypanosan; but appears to be progressing well now under treatment with Bayer 205.

On a Broncho-pulmonary Epidemic and its Treatment (R. Van Nitsen and P. Walravens).—During the months of August and September, 1922, an epidemic of bronchitis and pneumonia broke out among the workmen of the Union Minière at Likasi.

Examination of the sputum of the patients (365) showed the presence of the cocco-bacillus of Pfeiffer, the *Spirochæta bronchialis* of Castellani, staphylococcus, pneumo-bacillus of Friedländer, streptococcus, *Micrococcus catarrhalis*, and a Gram-positive diplococcus; the first three were predominant.

The treatment administered was intravenous injections of emetin, injections of colloids, and vaccine. Of ninety cases treated with emetin thirteen died; of 211 treated with colloids there were twenty-eight deaths, and only five deaths of fifty-six treated by vaccine. The vaccine consisted of pneumococci, staphylococci, streptococci, cocco-bacilli of Pfeiffer, and *M. catarrhalis* (500 millions of each).

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 2, February, 1923.

The Season of Onset of Kala-azar (T. C. McCrombie Young).—The coincidence district by district of the different seasonal incidence of kala-azar onsets with what the writer had recognized, independently of the evidence of these statistics and prior to dealing with them, as the distribution of somewhat different clinical types of the disease appears to him to add some significance to the indications of these figures. It is a commonplace of criticism that statistics can be made to prove anything, and those who know the many pitfalls which beset the path of an over-sanguine and incautious interpreter of Indian statistics will share with the writer a large degree of mistrust of the conclusions to which in this instance they seem to point. Nevertheless, in spite of the possible fallacies which the writer has indicated, it is difficult to resist the suggestion of these figures that there are, in fact, two types of onset of kala-azar, one of which is in the cold weather months and prevails in Nowgong and Sibsagar, the other is in the hot weather months, and is found in the Lower Assam Valley districts and Sylhet. The writer would suggest that these two types have somewhat different clinical characteristics, and possibly a different epidemiological significance.

If these conclusions are accepted their entomological implications are fascinating, for if an insect vector is concerned, it would appear possible that the insects concerned with the transmission of these two different types of onset may have a different seasonal prevalence and belong to different species, unless it be that the incubation period of the more chronic form of the disease is longer, although the time of infection is the same.

Outbreaks of Epidemic Dropsy (J. W. D. Mergaw and R. N. Banerji).—The authors are convinced of the necessity of taking into consideration seriously the old view that epidemic dropsy and beri-beri may be caused by a poison generated in rice under certain conditions, and that the preparation and storage of rice should be investigated from this point as well as from the point of view of deficiency. The association between high prices and prevalence of epidemic dropsy may not depend on the inferiority of the diet, but on the hoarding up of rice in anticipation of still higher prices and the consequent development of poisons in the rice. Such evidence as it has been possible to collect is in favour of this view, but conclusive proof is still lacking.

Further Notes on Filariasis (S. K. Roy).—Two cases of filariasis are described, the interesting features of which were as follows: In the first case stoppage of filarial fever took place as soon as the lymph began to ooze out from the scrotum, and reappeared when the oozing was stopped by operative measures, which shows that filarial fever is mainly due to lymph stasis. Stagnating lymph has

little bactericidal power, and hence is liable to frequent infection, which may be an additional factor in the causation of the fever. The disappearance of filarial fever for two years after removal of the serotal tumour in the second case was also noted. Another point noticed was the passage of a large number of filarial ova at various stages of development in the lymph for many days at a stretch, but of only one or two fully stretched embryos during this period. If ova are not the natural products, but are only the products of miscarriage of the adult filaria, it is difficult to understand this continuous discharge of developing ova for many days in the lymph, which is continuously oozing out, as also in the chylous urine. Besides, filarial ova have been found to stretch their sheaths quite freely in the lymph, and these forms were the predominant ones in the lymph. From these observations one is inclined to believe that filariae are oviparous rather than viviparous. The small number of the fully stretched embryos is perhaps due to the fact that as soon as they have got fully-stretched sheaths they leave the lymph-stream to gain access to the blood. They may thus wander to the anastomotic lymphatic channels and cause embolisms there, and ultimately elephantiasis. It is to be noted that, though many of the ova found in the lymph in this case were large, they could easily pass through the minute lymphatic channels, and there was no ova embolism or elephantiasis of the part. Another feature was the appearance of pruritus and dermatitis of filarial origin.

In the second case an erysipelas-like attack of lymphangitis of the arm occurred, also retention of the urine due to lymphatic masses of filarial origin was noticed.

Review.

THE HOME AND HEALTH IN INDIA AND THE TROPICAL COLONIES. By Kate Platt, M.D., B.S.Lond. Formerly Principal, Lady Hardinge Medical College and Hospital for Women, Delhi, India. London: Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden. 1923. Pp. 210.

This carefully-prepared book is especially written for women who are making their home in the tropics, and is taken up with social and domestic conditions, the child in health and in sickness, and how to act in sudden illness until the doctor arrives. How useful all this is to the woman resident in the tropics can only be known by the British residents in the tropics where doctors are wide apart, nurses are difficult to be had, and where disease is sudden and severe. General sanitation and the special hygiene appropriate to tropical life is primarily dealt with. The infantile maladies are both types met with in temperate and tropical climates, and much practical and sensible advice is given by the authoress. Precautions against germ-carrying

insects find a prominent place in the text; and the more prevalent ailments, worms especially, are clearly and wisely handled. It is a safe and useful book to recommend to travellers, sojourners and residents in tropical countries. J. C.

Medical News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT.

Distinction: Harsant, A. G. (Duncan Medal); Briercliffe, R.; Cook, C. E.; de Boer, H.; Adcock, E. W.

Passed: Han, C. H.; Rebello, A. C.; Simpson, R. H.; Godding, H. C.; Martin, C. de C.; Dhawan, M. L.; Wijeyeratne, J.; Thomas, F. S. T.; Ghosh, J. M.; Kelly, R. W. C.; Jameson, W. J.; Walsh, P.; Wilkinson, S. A.; Stockley, H. G.; Manfield, A. H.; Macadam, Miss N. R.; Lupprian, E. V.; Krikorian, K. S.; Cross, B.; Garewah, A. C.; Hodge, H. P.; Lindow, E. D.; Matthews, V. Mathew.

UNIVERSITY OF LIVERPOOL.

EXAMINATION LIST. MARCH, 1923.

Faculty of Medicine.

Diploma in Tropical Medicine: D. Basu, M.B.; J. C. Cruickshank, M.B., Ch.B.; Winitfred I. Doherty, M.B., Ch.B.; J. Elsohn, M.B., Ch.B.; R. N. Raja, L.R.C.P. & S., L.R.F.P. & S.; C. F. White, M.B., Ch.B.

Recommended for the Alan H. Milne Medal: Dr. J. C. Cruickshank.

THE Fifth Congress of the Far Eastern Association of Tropical Medicine, Singapore, Straits Settlements, September 3rd—17th, 1923.

Hon. Secretary and Treasurer for Malaya:

J. W. SCHARFF, M.D., D.P.H.,

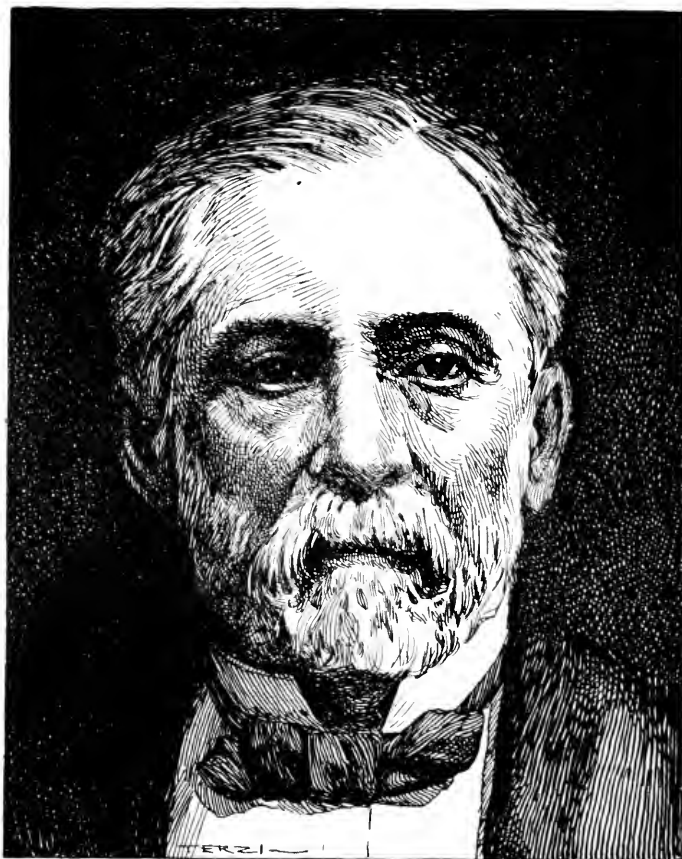
GOVERNMENT HEALTH OFFICER, SINGAPORE.

Anyone desirous of attending the Congress, or wishing to submit papers, should communicate with the Honorary Secretary.

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LOUIS PASTEUR.

Ayez le culte de l'esprit critique. Réduit à lui seul, il n'est ni un éveilleur d'idées, ni un stimulant de grandes choses. Sans lui, tout est caduc. Il a toujours le dernier mot.

2. F. G. H. /

PASTEUR AND HIS WORK HISTORICALLY CONSIDERED.

By LOUIS W. SAMBON, M.D., F.Z.S.

Lecturer to the London School of Tropical Medicine.

SCIENCE, industry, mankind throughout the civilized world are celebrating the centenary of Louis Pasteur, the son of a French tanner, born



at Dôle, Jura, on December 27, 1822. Schooled at Arbois, Besançon and Paris, he became a chemist, elucidated fermentation, demolished the theory of spontaneous generation, discovered the living causal agents of several diseases affecting animals and man and achieving the attenuation of the virulence of pathogenic bacteria left in our hands a mighty weapon for the control of epidemics. His researches saved industries, made wealth and prolonged life; his experiments established positive truths; the whole of his work was beneficent. No new explosives, destructive of life and property, no murderous gases, no aids to adulteration and fraud, no subtle poisons wherewith to colour and flavour children's sweetmeats. The world is better that he lived. We claim him as proudly, as gratefully, as his native land. "The whole earth is the monument of illustrious men."

Louis Pasteur's father belonged to that sturdy, hard-working class which is the backbone of a nation; he had served in the Peninsular War and had been decorated on the battlefield by Napoleon. The mother was a gentle, active, gifted woman of the Roqui family. The sacrifices made by the father for the education of his children, the loving solicitude of the mother, the devotion of their son are high lights in the life-picture of this great savant who wrote on the first page of his "Études sur la Bière":—

"A la Mémoire de mon Père, ancien militaire sous le Premier Empire, Chevalier de la Légion d'Honneur.

"Plus j'ai avancé en âge, mieux j'ai compris ton amitié et la supériorité de ta raison.

"Les efforts que j'ai consacrés à ces Etudes et à celles qui les ont précédées sont le fruit de tes exemples et de tes conseils.

"Voulant honorer ces pieux souvenirs, je dédie cet ouvrage à ta mémoire."

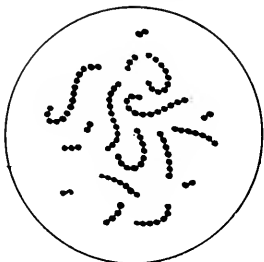
In 1850, whilst deputy professor of chemistry at the University of Strasbourg, Pasteur married the daughter of M. Laurent, Rector of the Strasbourg Academy. "The world owes much to Pasteur's wife," said Sir William Hale-White in his celebration address at the Royal Society of Medicine on February 28, 1923; "not only was she an incomparable companion, but his best collaborator. That he would have given less to humanity had he chosen a different wife must be true. The gods smiled on us when he married Madame Pasteur."

As a rule the world is either indifferent to those who devote themselves wholly and unreservedly to the advancement of knowledge, or it persecutes them, often cruelly. Need we recall the forced abjuration of Galileo, the imprisonment of Columbus, the burning of Servetus? Truth still claims its victims. The present-day leaseholders of Science are not less intolerant than the Church.

In 1847, the Hungarian obstetrician, Ludwig Ignaz Semmelweis, reasserting ideas expressed long before by Thomas Denman, Gordon of Aberdeen and Oliver Wendell Holmes,¹ not only maintained that childbed fever was conveyed from patient to patient by physicians and nurses, but by adopting strict antiseptic methods (disinfection of hands with chlorinated water before examining patient, &c.) he actually reduced the death-rate among lying-in women from 12 to 3 per cent. Far from being appreciated, he was misjudged, meanly attacked, hounded down and finally driven mad.

¹ Thomas Denman in the introduction to his "Practice of Midwifery" (1788) pointed out that childbed fever is carried sometimes by doctors and midwives, who have attended puerperal fever patients, to other lying-in women. This danger was strongly emphasized by Dr. Gordon of Aberdeen in his famous treatise on "Epidemic Puerperal Fever" (1795). "This disease," he says, "seized such women only as were visited or delivered by a practitioner, or taken care of by a nurse who had previously attended patients affected with the disease." Further on: "It is a disagreeable declaration for me to mention that I myself was the means of carrying the infection to a great number of women," and finally: "I arrived at that certainty in the matter that I could venture to foretell what women would be affected with the disease upon hearing by what midwife they were to be delivered, or by what nurse they were to be attended during their lying-in, and almost in every instance my prediction was verified." This damaged so greatly Dr. Gordon's professional prospects in Aberdeen that he was obliged to return to active service in the Royal Navy, in which he had started his medical career. In 1843, Oliver Wendell Holmes, Professor of anatomy and physiology in the medical school of Harvard University, poet, essayist and novelist, wrote a memorable essay "On the Contagiousness of Puerperal Fever" (*New England Quarterly Journal of Medicine and Surgery*, April, 1843). Written by the author of the "Autocrat of the Breakfast Table," this article is an admirable, powerful, unforgettable indictment of the culpability of the unclean obstetrician. Holmes was attacked by the two leading professors of obstetrics in his own country. One of them, Dr. Mcig, said: "I prefer to attribute them (the epidemics of puerperal fever) to accident or Providence, of which I can form a conception, rather than to a contagion of which I cannot form any clear idea, at least as to this particular malady." In 1829, Robert Collins, Master of the Dublin Lying-in Hospital, had disinfected all his

Some years later, at the Paris Academy of Medicine, Pasteur, dramatically interrupting a discussion on puerperal fever, shouted: "Ce qui cause l'épidémie, ce n'est rien de tout cela; c'est le médecin et son personnel qui transportent le microbe d'une femme malade à une femme saine!" and the retort being that no microbe



Streptococcus.

would be found, he rushed to the blackboard and drew a circle, exclaiming: "Tenez! voici sa figure." Whether Pasteur's hasty outline was as round as Giotto's circle, or oval like the egg of Columbus, matters little, for certainly, like Giotto and Columbus, he baffled his audience and carried conviction. He had cultivated streptococci from cases of puerperal fever and looked upon them as the cause of the disease.

Sometimes Fortune will smile on perseverance, or, like Titania, she may stray with some long-eared Bottom. The favoured one rises at once to highest eminence; often he is credited with the work of others and loaded with undeserved honours. He becomes a hero. No one dares to disagree.

Pasteur is not the hero of one haphazard discovery. His vast and active intellect, keen foresight and wonderful deductive power, his indefatigable energy and compelling enthusiasm, the shrewdness of his observations, the exactness of his methods and, above all, common sense of the highest order made him a very forge of inventions.

To understand thoroughly and appreciate the full value of Pasteur's researches we must view them in their true perspective. Many of those who have panegyricized his work have shown amazing ignorance of the history of industry, chemistry and medicine, wronging other workers without adding one iota to Pasteur's renown.

No great discovery ever has been, or can be, made entirely by one man. Just as the huge unwieldy ear of Jagannath is dragged out of the

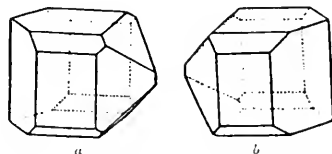
temple of Puri at the time of the Rath-Jatra by thousands of eager worshippers, so the ear of Science needs countless hands to drag it out of darkness, and many are those who fall and are crushed beneath its wheels.

CHEMICAL RESEARCHES.

Pasteur's first researches were purely chemical; in these he earned laurels at the very outset of his scientific career. His studies on the optical properties of tartaric acid and its salts are well known. Of him Biot said: "Il éclaire tout ce qu'il touche."

In 1808, Malus had discovered that light reflected from a sheet of glass becomes polarized. Three years later Arago had found that when a ray of polarized light passes through a plate of quartz the plane of polarization is distorted, giving rise to chromatic effects of exquisite beauty. Biot (1812) had pointed out that the distortion takes the form of a uniform rotation of the plane of polarization, but that while some plates of quartz rotate this plane to the right, others rotate it to the left. A similar optical activity he had discovered in tartaric acid and in other natural organic compounds such as sugar and camphor. Häuy had observed that, owing to the side on which certain tiny facets (hemihedral facets) are placed, quartz crystals assume two different geometrical forms (right- and left-handed) not superposable, but, like our hands, convertible into one another by reflection in a mirror; and Sir John Herschel (1820) had shown that these two forms rotate the plane of polarization in opposite directions. Finally, in 1844, Mitscherlich had drawn attention to the fact that the salts of the isomeric modifications of tartaric acid, studied by Berzelius, though possessing the same chemical composition and the same crystalline form, behave very differently as regards their optical activity, because, whilst solutions of the tartrates rotate the plane of polarization, those of the racemates remain inactive.

In 1848, while examining crystals of the two forms of tartaric acid and of some of their salts, Pasteur noticed that some presented tiny hemihedral facets as described by Häuy in quartz.



(a) Destro-tartaric acid; (b) Lævo-tartaric acid.

wards in rotation by filling them with chlorine gas for the space of forty-eight hours. In addition, the floors were scoured with chloride of lime mixed with water to the consistency of cream, walls and ceilings were treated with fresh lime, blankets and all other linen washed and stove to a temperature of 1200 to 1300 F. Thus had he successfully overcome the puerperal pestilence which had raged fiercely since 1827. All this before Semmelweis. But it had been forgotten!

These asymmetric crystals belonged to the optically active tartrates, but hitherto the tiny facets which make them lop-sided had escaped observation. The racemate crystals were symmetrical. However, on recrystallizing the racemates Pasteur obtained two sets of crystals both presenting hemihedral facets, one on the right side, the other on the left. When

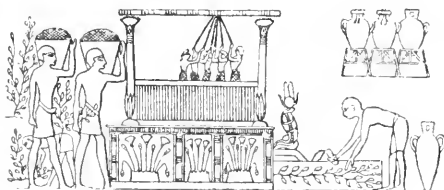
solutions of these enantiomorphs were examined they were found to rotate the plane of polarization in opposite directions. The dextro-rotatory acid was found to be ordinary tartaric acid (already Mitscherlich had observed that one of the salts of para-tartaric acid gave rise to crystals of precisely the same type as the corresponding tartrates), the corresponding laevo-rotatory acid was new to Science. Thus Pasteur discovered that the optical inactivity of racemic acid is due to the fact that this acid consists of right-handed and left-handed crystals in equal proportion, and neutralizing one another as regards the polarization of light.

Pasteur was six and twenty years of age when he made this discovery, and Biot insisted that the decisive experiment be repeated in his presence. "He provided me," says Pasteur, "with some para-tartaric acid, which he had already studied with particular care and which he had found to be perfectly neutral towards polarized light. I prepared the double salt in his presence, using for the purpose soda and ammonia, which also he himself had provided. The liquor was left in one of his rooms to evaporate slowly and, when it had furnished 30 or 40 grm. of crystals, Biot asked me to come to the Collège de France to collect them and to separate them under his eyes, by their crystallographic characters, into right- and left-handed crystals. Also he asked me again whether I could positively assert that the crystals which I placed to his right would rotate the plane of polarization to the right and the others to the left. Then he told me that he would do the rest. He prepared the solutions of carefully regulated strengths, and just when he was about to observe them in the polarimeter, he invited me afresh to come into the room. He placed in the apparatus first the most interesting solution, that which would rotate the light to the left. Without stopping even to make a measurement he saw, at a glance, by the colours of the ordinary and extraordinary images in the analyser, that there was a strong deviation to the left. Visibly moved, the illustrious old gentleman grasped my arm and said to me: "Mon cher enfant, j'ai tant aimé les sciences dans ma vie que cela me fait battre le cœur."

In 1853, the French Government conferred on Pasteur the Ribbon of the Legion of Honour, and in 1856 our Royal Society awarded him the Rumford medal.

A Strasbourg firm of manufacturing chemists having observed that solutions of impure commercial tartrate of lime fermented in warm weather and gave rise to various products, Pasteur started inducing fermentation in solutions of tartaric acids. In the case of para-tartrate he noticed that the solution, originally inactive, exhibited, as fermentation proceeded, a gradually increasing deviation of the plane of polarization to the left until a maximum was reached when fermentation ceased. Thus he discovered that, during the process of fermentation, the right-handed acid had been consumed, leaving the left-handed acid which, freed from the constraining influence of its right-handed

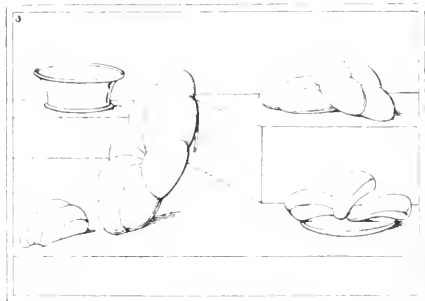
partner, was able to assert itself and exhibit its left-handed rotatory power. This selective action of fermentation on the laevo-acid proved the physiological importance of the least difference in molecular arrangement. These experiments were the beginning of Pasteur's great work on fermentation.



Large wine footpress and amphorae, Beni Hassan.

FERMENTATIONS.

Bread, cheese, wine, mead, beer, cyder, koumiss, vinegar, all attest the remote antiquity of the world's knowledge of fermentation. All these things were made by prehistoric man. He knew perfectly well how to induce alcoholic fermentation, how to regulate it, how to check it, how to prevent other undesirable fermentations. In the matter of foods and beverages, have we invented anything so wonderful as leavened bread and wine? Is the metamorphosis of the worm-like caterpillar into a beautiful wide-winged iridescent creature of the air more marvellous than the transformation of small stony grains of wild wheat into the miracle of a well-risen, well-baked loaf of whitest bread, scored

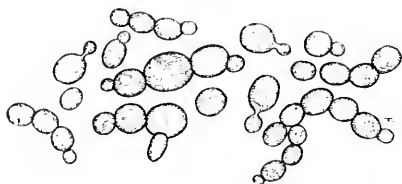


Leavened bread, Pompeii.

daisy-like, such as have been found turned to charcoal in the long-buried ovens of Pompeii, or the conversion of rough wild grapes into sparkling, vivifying beverages of liquid sunshine such as have been sung by Horace and Omar Khayyám?

A complete survey of the history of fermentation throughout the ages would be long and out of place. We must come down to Antonius von Leeuwenhoek, a Dutch microscopist of the seventeenth century, whose letters to the Royal Society of London are deservedly famous. In 1675, he examined yeast under a low-power microscope of his own construction, and found it to consist of

minute living cells of globular or ovoid form. A century later (1776) a celebrated Italian naturalist, Lazzaro Spallanzani, proved by experiment that the fermentation and decomposition of organic matter could be prevented by boiling putrescible substances and keeping them hermetically closed so as to prevent the access of atmospheric air. These principles and methods, well known to the ancients, were again put forward, in 1809, by Nicholas Appert, a Parisian cook, pickler, distiller and confectioner, who submitted a method of preserving foods for sea-service and military stores. Appert's method consisted in packing the substances to be preserved into hermetically-sealed vessels and submitting the latter to a high temperature in an open water-bath. As is well known, Appert's researches and methods were the starting-point of the vast canning industry of our day.



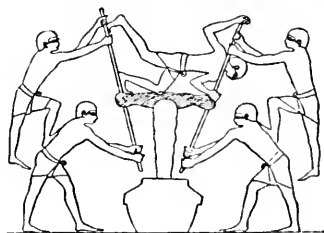
Saccharomyces cervisie.

The results obtained by Spallanzani and Appert were explained by Gay-Lussac as due to the exclusion of atmospheric oxygen, which he believed to be the main cause of fermentation. In 1837, Cagniard-Latour, who had microscopically examined the yeast cells and noticed their peculiar budding method of reproduction, revived the vital theory of fermentation by pointing out that the yeast cells are intimately associated with the process of fermentation. Soon after came Schwann, who confirmed Latour's observations and demolished Gay-Lussac's theory of the dependence of fermentation upon the access of oxygen, for he proved by means of experiments that putrescible substances could be preserved unchanged even if they were brought in contact with air, so long as the air had been sufficiently sterilized by heat first. He showed that fermentation always commenced with the appearance of the yeast cells in the "must," that it progressed with their increasing multiplication and that finally it terminated with the cessation of their growth and activity. By the use of various substances, some more noxious to animal than to vegetable organisms, he not only checked the growth of the yeast cells but proved that they are of vegetable nature. Supported by his numerous observations and experiments, Schwann emphatically maintained the intimate, undeniable connection of the yeast cells with the process of fermentation. Turpin repeated these researches and again very definitely formulated the vitalistic theory of fermentation.

Against all this excellent work stood a colossal antagonistic force in the personality of Baron

Justus von Liebig, one of Germany's greatest chemists, who brought the weight of his authority to oppose the vitalistic theory. He held the ferment to be an unstable organic compound easily decomposed, which, in decomposing, shook apart the molecules of the fermenting material. "Those who pretend to explain the putrefaction of animal substance by the presence of micro-organisms," he wrote, "reason very much like a child who would explain the rapidity of the Rhine by attributing it to the violent motions imparted to it in the direction of Bingen by the numerous wheels of the mills of Mayence."

Then Pasteur entered the lists and long and furiously raged the controversy. But Pasteur was a born master of the experimental method and the battle ended in the triumph of the vitalistic theory. Pasteur not only proved more convincingly, more definitely what others already had ascertained, but in doing so he perfected the old methods of research, he opened up new paths and, indeed, together with Henle, Koch and Weigert, laid the very foundations of the science of bacteriology. He discovered "anaerobic" life, proved that there is no fermentation without living organisms and that each kind of fermentation is brought about by a particular or "specific" organism. He isolated the organisms which produce lactic, butyric and acetic fermentations, studied the diseases of wine and popularized that method of sterilization (heating merely to the temperature necessary for the destruction of the organisms of fermentation) now universally known by the name of "Pasteurization." He poured from the wine bottle with its maladies a stream of knowledge to elucidate and



Pressing grapes by means of bag and poles, Beni Hassan

conquer the distempers and plagues of animals and man, thus giving a new, more truthful and dignified meaning to the old dictum: "in vino veritas."

THE ACETOUS FERMENTATION.

Pasteur's work on acetous fermentation consisted of many well conceived experiments. Satisfied with the result of his investigations, he went straight to the vinegar manufacturers of Orléans and pointed out to them that exact scientific knowledge could improve their methods, accelerate the acetous process and ensure against the failures of the past. He had not made any new discovery.

the making of vinegar is as ancient as the making of wine, probably older, because from remotest antiquity other alcoholic liquids, such as palm wine and sugar-cane juice, have been used in the manufacture of vinegar. However, to limit our observations to modern times, we need but recall that Lavoisier already had explained clearly the part played by oxygen in the souring of wine. The "miliar pellicle" or "mother of vinegar" which forms on the surface of the acetifying liquid was shown to be a vegetable growth and Persoon, an English naturalist, had given it the name of *Mycoderma* in 1812. Kützing, in 1837, had shown that the pellicle was the product of a living organism, which he called *Ulvina aceti*, and positively asserted this minute plant to be the cause of acetous fermentation. Pasteur's merit in the matter was that he managed to convince. Bitter experience had taught the vinegar manufacturers the importance of that fragile pellicle which veiled the liquid in their vats; they knew how easily it might break, become submerged and form a noxious gelatinous mass, how difficult it would be for another skin to form, and how great the loss of time and money. Pasteur told them that by exposing the vats containing the mixture of wine and vinegar to a temperature of from 20° to 25° C., and artificially sowing on the surface a small quantity of a pure culture of *Mycoderma aceti* vinegar could be produced in a week or ten days. Instead of requiring two to three months. "I undertake," said he, addressing the Academy of Sciences, "to cover a surface of vinous liquid equal in extent to the area of the hall in which we are assembled with *Mycoderma aceti* in the space of twenty-four hours. I have only to scatter there the day before shreds of the mycoderma which could be hardly visible."

Pasteur's views on acetous fermentation were contested by Liebig, and the French investigator at once made rejoinder that they should submit their difference to arbitration. Liebig refused, and justly so, because Time is the only arbiter in matters scientific.

Writing to Duclaux, in 1872, the great German chemist said: "I have often thought during my long and practical career [he was 69 years of age] how much labour and how many researches are necessary to understand a somewhat complicated phenomenon. The greatest difficulty arises from the fact that we are too much in the habit of ascribing to one cause that which is produced by several, and the majority of our controversies thus arise. I should be very sorry if M. Pasteur were to take in bad part the remarks I made in my last work on fermentation. He appears to have forgotten that I only sought to sustain by facts a theory I had originated now more than thirty years ago and which he attacked. I had, I believe, the right to defend it. There are very few men whom I esteem more than M. Pasteur, and he can rest assured that I did not dream of injuring his reputation, which is so great and so justly acquired.

I assigned a chemical cause to a chemical phenomenon, and that is all that I attempted to do."

Now we know that, as maintained by Liebig, the oxidation of alcohol, to obtain acetic acid, may be brought about by a purely chemical process. Indeed, already in 1721, Davy had discovered that if slightly diluted alcohol be dropped upon platinum black, the oxygen condensed in that substance acts with energy upon the spirit and, union readily occurring, acetic acid results. Hitherto, however, in making vinegar for the table, not a chemical, but a vital agent had been employed to persuade the hydrogen of the alcohol to unite with the oxygen of the air. Thus prepared, vinegar is the product of a true fermentation. The "mother of vinegar" is a floating mass of micro-organisms practically felted into a live spreading fabric. Pasteur did not study it fully; there are several vinegar plants, not one, as he thought, all differing in the amount of acetic acid they produce and in the temperature and other conditions favouring their growth and activity. The most common and best known are *Bacterium aceti*, *B. pasteurianum*, *B. kützingianum* and *B. xylinum*.

No less interesting than the flora is the fauna of vinegar. The "Vinegar-Eel" (*Anquillula aceti*), a slender round worm about two millimetres long, used to be very common in the old unsophisticated vinegar, but the poor thing cannot possibly live in the sulphuric acid of present-day "vinegar." However, Pasteur has shown that, far from being necessary, the vinegar-eel is injurious to the acetifying process. More important, perhaps, are the little "Vinegar- or Fruit-Flies" (*Drosophilidae*), the white slender larvae of which are frequently found in fermenting liquids, canned fruits and pickles. These flies are attracted irresistibly by the aroma of vinegar and often spend their whole life, from egg to winged stage, within the pickle-jar. Dr. Duclaux, one of Pasteur's fellow-workers, believed that, like other flies which either subserve cross-fertilization among plants, by carrying and scattering pollen from flower to flower, or engender pestilence among animals and men, by disseminating disease-germs from the sick to the well, so likewise vinegar-flies play an important part in promoting the acetous fermentation by fostering and conveying acetic bacteria. One might also mention ants in connection with both vinous and acetous fermentations, because, as pointed out by a well-known Italian entomologist, Dr. Berlese, they play a very active part in the vineyard by scattering yeast cells, moulds and bacteria over the maturing grapes.

Pasteur's suggestions with regard to the making of vinegar were not adopted generally. His methods, though rapid and safe, did not produce a good vinegar possessing those exquisite ethereal and aromatic principles which for centuries had proclaimed the excellence of Orléans vinegar. Eventually, no doubt, chemists and biologists working together may reach perfection in the making of wines and vinegars, but many more re-

searches, many more experiments will be necessary before modern science shall be able to replace the time-honoured, world-wide methods of the past. Whatever we may think of the knowledge of the ancients, one thing is certain: they were the inventors of all our wonderful food products, and these they brought to a nicety which never has been surpassed. No wonder, therefore, that the vinegar-vat, like the smoked koumiss skin-bag (saba) among the Kirghiz, was passed jealously from father to son! What has the modern chemist so far achieved in the matter of vinegar? He began by poisoning us with all kinds of mineral acids, then he gave us a vegetable product, pyroligneous acid or "wood-vinegar," a perfect abomination which is only cheap! Already many years ago, speaking of "ordinary English vinegar," Dr. Blyth said it was "a chemical monstrosity." To-day, copying Oriental figurativeness, we might we say: "God, by sowing life, made wine-vinegar; the Devil, by a process of destructive distillation, made wood-vinegar."

THE DISEASES OF WINE.

The researches on acetous fermentation led Pasteur to investigate other diseases of wine, because souring, though giving rise to a most agreeable and useful product, is none the less a malady, perhaps the most common, to which wine is subject. It was but natural to suppose that, like souring, the other diseases also were fermentations. Indeed, Pasteur was able to show that each one of the various diseases, such as turbidity, ropiness, bitterness, acidity, &c., is the product of a distinct microscopic organism. But he only broached the subject and it will be long ere we shall understand thoroughly the many alterations of colour, limpidity and flavour to which alcoholic beverages are subject. Many of these changes are the outcome of very complex processes of metabiosis.

To prevent diseases in wines and vinegars that have to be kept for long periods and especially in those that have to be transported overseas to warm climates, Pasteur suggested that these products, after bottling, be submitted to a temperature of from 55° to 60° C., because he had found by experiment that such a temperature, aided by the

Beaume from Le Havre to Santo Domingo, previously heating them in a water-bath to 70° C. On their return, the sterilized bottles were opened and the wine contained therein compared with the wine of the same cuvée kept in similar bottles which had neither travelled nor been subject to the heating process. Appert assures us that the cooked wine which had travelled through the tropic zone was found to be superior to the same uncooked wine which had been kept at home. Obviously the unsterilized wine had deteriorated. Several years later, Pasteur also sent wine abroad by boat after sterilization, together with control bottles of the same wine unsterilized. The Commission appointed by the French Admiralty to report on the result of the experiment stated that, while the wine submitted to heating was found to have retained all its good qualities unimpaired, the uncooked wine had become sour.

But the cooking or sterilizing of wine by heating, to prevent spoiling, was resorted to long before the days of Pasteur and Appert. Massonio, in his book on Salads, published in 1627, says: "In many countries, where wine has to be kept more

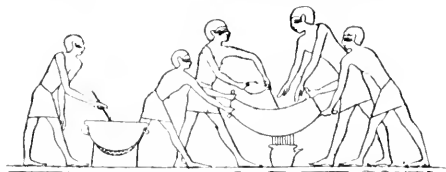


Solidified wine 2,000 years old.

than a year to mature, it is cooked to prevent souring." The ancient Egyptians, Greeks and Romans very generally adopted this method of preservation, in addition to salting, spicing and tarring. Indeed, some of their wines, kept in well-corked and luted, but porous earthenware vessels, became so greatly concentrated by heat, when exposed in the "fumarium," that they could not be poured out of the containing amphore until dissolved by means of hot water. I possess a lump of ancient Roman wine which looks very much like a block of colophony encrusted with some ochraceous substance. It came from a small amphora found in the cellar of Florus' famous villa at Boscoreale, near Pompeii. Notwithstanding its age of nearly two thousand years, it has preserved the unmistakable aroma of modern Campanian wines, a bouquet which made it celebrated in Horace's time.

SPONTANEOUS GENERATION.

In the course of his studies on fermentation Pasteur came face to face with the enigma of the origin of life. M. Pouchet, Director of the Natura

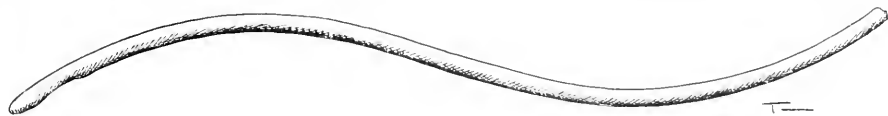


Filtering and cooking wine, Beni Hassan.

alcohol contained in the wine, or the acid in the vinegar, sufficed to render them inalterable, if well protected from air contamination, without in any way affecting their taste and aroma. In this, however, he had been anticipated by Appert, the confectioner, who already had sent bottles of

History Museum at Rouen, had reopened the everlasting controversy on spontaneous generation. In 1858, before the Academy of Sciences, after stating that, though using oxygen instead of atmospheric air, living micro-organisms had come into being spontaneously within his sterilized infusions of hay, he pertinently inquired: "What say now the adversaries of spontaneous generation?" Pasteur picked up the gauntlet and, though Dumas, Biot and others endeavoured to dissuade him, devoted four years of incessant labour to combating the hydra-headed theory.

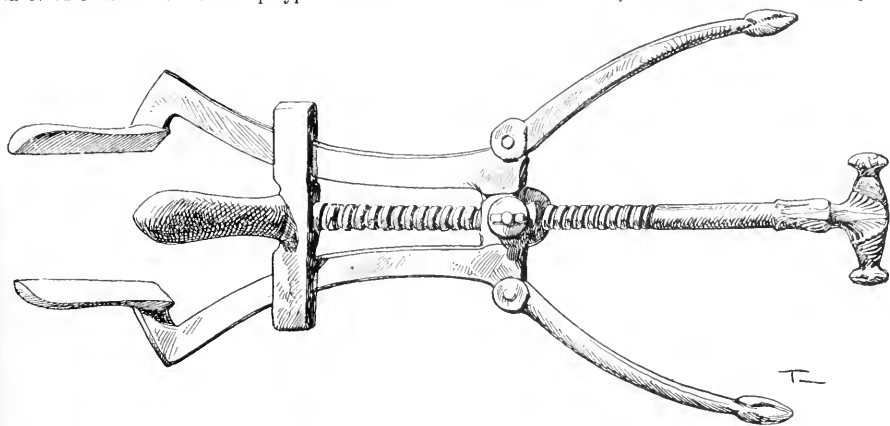
stood epigenesis, the discovery of which has been wrongly ascribed to Harvey. Moreover, they applied their knowledge judiciously to useful purposes. Thus they hand-pollinated the date-palm, as we learn from the writings of Theophrastus as well as from Babylonian sculptured slabs, and they practised the caprification of the fig-tree to ensure the ripening of its pear-shaped synconia—the enclosed female inflorescences which we call figs—by bringing to it the tiny pollen-dusted fig-insects (Blastophaga) which issue from the gall-flowers of the inedible *Caprifig* synconia, so Theophrastus,



Ancient Roman catheter found at Pompeii.

The belief in spontaneous generation was held by some of the earliest known philosophers and even now is rife in one or other form, though not so crudely expressed as during the Middle Ages. Among the ancients we find views as plausible, as sound, as lofty as any we now hold. Modern theories concerning the molecular constitution of matter, the progressive evolution of organic beings, the survival of the fittest, adaptation, heredity and atavism already were foreshadowed in the works of Anaximander, Anaxagoras, Leucippus, Empedocles, Democritus, Aristotle, Theophrastus and Lucretius. Is it necessary to say that these ancient naturalists and philosophers, more closely in touch with Nature than are we—we polyps of the brick-

Herodotus and Pliny tell us. They propagated the banana by suckers and the sugar-cane by cuttings until these plants became practically seedless, and they grew luscious varieties of fruit (the seeds of which probably would not breed true) by grafting and budding them on strong stocks producing poor meat. One cannot read the thirtieth chapter of Genesis without being struck by Jacob's skill in the rearing of stock. Certainly Mendel had a cunning anticipator thirty-six centuries ago! The Ancients fished with rod, line, net, torch and trident, with trained dogs, otters, cormorants and sucking-fish (*Remora*), with trap and fish-intoxicants, but frequently they used the spawning female fish to capture males of the same species;



Three-bladed vaginal "speculum," Pompeii.

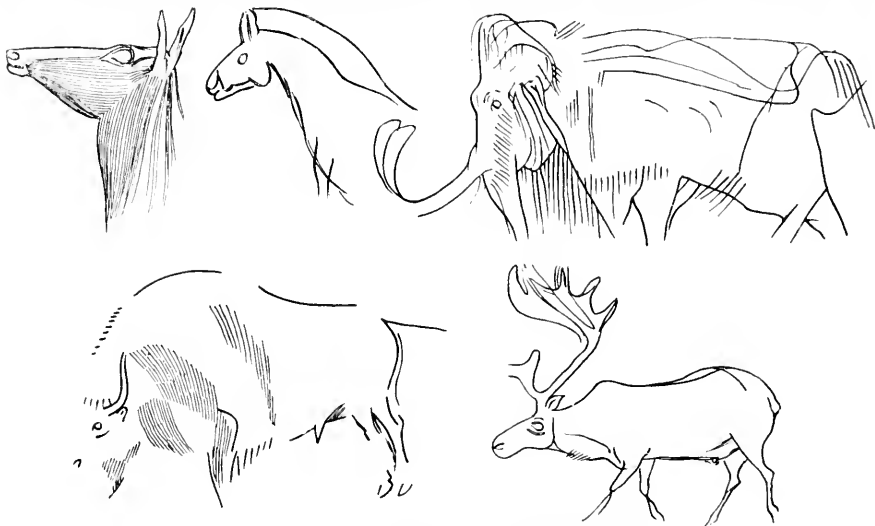
reef—held correct views concerning the reproduction of animals and plants? They knew perfectly well that reproduction in most animals is effected by means of eggs which need to be fertilized, in plants by seeds which need to be pollinated. They knew the several modes of asexual reproduction, such as fission, budding, parthenogenesis, and they under-

they gathered the spawn of fish and of edible molluscs, built fish-ponds innumerable and farmed the sea as we farm the land.

"Mere guesses," say you. Well, sir, if it were so, if the Ancients could discover by intuition that which cost us centuries of labour to rediscover, we should have to acknowledge that mentally they were superior

to us. But tell me, were these mere guesses—Phœnician glass, Chinese porcelain, red-glazed Arretine ware, bronze alloy, well-tempered steel and the Tyrian purple dye made of whelk, coccid and orchil pigments fixed by a tin mordant? Were they also guesses—the complicated harpoon and the returning throwing-club of the ancient Egyptians, the Sagartian lasso mentioned by Herodotus, the Balearic sling with its leaden bullets made hot and inscribed "Take this," or the snapping bow with its feathered arrows rotating, whistling, flashing through the air and carrying separable barbed heads dipped in some poison-compound such as wourali? Were they mere guesses—the burden-basket, the inflated skin-float, the frame-boat with its oars, rudder and sails, the sledge, wheel-cart and scythed

its secret catch; the syringe, the catheter, speculum, trocar and trephine found at Pompeii; the jointed artificial hand of steel with which, as Pliny tells us, "Marcus Sergius fought a battle, raised the siege of Cremona, defended Placentia and took twelve of the enemy's camps in Gaul"? Were these but guesses—cloth, parchment, paper and carbon-ink scented with musk, the mighty pen with its split nib and the wearisome needle with an eye for cotton; the sandstone lamp of Magdalenian man with its fat and wick, the Etruscan wax candle and cleansing soap? And were they mere guesses—Punic cistern, Roman aqueduct and Etruscan sewer; the close-meshed cotton-netting of ancient Egypt to bar germ-fostering flies and mosquitoes, the boiling and aromatizing of water by Romans.



Animal sketches by Paleolithic man of the Magdalenian age.

war-chariot; the drill, screw, pulley, plough, potter's wheel, lathe, loom and windmill; the force-pump of Ctesibius, the mirrors of Archimedes and the steam-engines described by Hero of Alexandria? Were they mere guesses—the kite, the thong-whipped spinning-top and the glorious game of chess, called *chaturanga* by the ancient Hindus; the drum, trumpet, double flutes and water-organ, the kithara with its resonator, wire strings and plucking plectrum; the kiln-baked brick made of clay and sand, the daring arch made of wedge-shaped stones, the skull-like vault and the superb Greek column—a tall tapering shaft of marble with slight entasis, so like the stem of the Royal Palm? And what about Egyptian hieroglyphics and Phœnician alphabet, Babylonian maps and star-charts, the Roman calendar, the abacus, sun-dial, water-clock and mariner's compass of the ancient Chinese? Have you forgotten the plummet, the measure and the balance—the strong-box and the padlock with

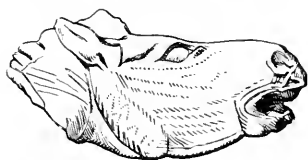
Persians and Chinese with effect to avoid water-borne diseases; the pitting of cat, mongoose, kestrel and rat-eating snake against the plague-carrying rat; the ligation of arteries, the excision of spleen, ovaries and womb, tracheotomy, craniectomy, rhinoplasty, castration, circumcision and the suturing of intestinal wounds with ants' heads wrenched from their bodies after their toothed mandibles had clasped and were fixed; the domestication of little brother dog, suckled at the very breast of woman, the bestriding and taming of the wild Mongolian horse until animal and man, strong, fleet limbs and predominant brain were welded into a Centaur; the incubation of the eggs of ducks and fowls in special ovens and other inventions innumerable?

And were they only guessing, these Ancients, when they determined the length of the year, when they measured the diameter of the earth, when they foretold lunar and solar eclipses?

You may have seen the Acropolis of Athens. It

is the most wonderful group of buildings in the world, not for size, but for perfect beauty. Recall the Parthenon, its columns swell towards the middle like graceful female arms, they are not perpendicular, but incline slightly inward, while the anta capitals slope forward; the stylobate is not level, but convex, the architrave also has a rising curve, but slighter than that of the stylobate. There is not one straight line, all are constructed as the arcs of vast circles standing in fixed relation. Thus did Iktinos, the architect, obviate unpleasant optical illusions, avoid mathematical rigidity and give the beauty of living things to the marble blocks he piled up on the blue-grey rock of Athens in honour of the Maiden Goddess. Was all this guessing?

Have you seen the sculptured metopes and the pediment groups of the Parthenon, the caryatids of the Erechteam, the Hermes, the Aphrodite, the Apollo Sauroctonos, the leaning Satyr of Praxiteles, Paenonius' Nike, Lysippus' Apoxyomenus, Scopas' Niobe, the Sophocles of the Lateran Museum, the Victory of Samothrace, the Venus of Melos? Have modern sculptors ever approached the beauty, dignity and excellence of classical sculpture? And might we not go farther back and recall the life-like animal paintings of ancient Egypt, the wonderful Assyrian bas-reliefs representing lions, onagers, humped cattle, mules and mastiffs, the striking pictures in charcoal and ochre of bridled horses, reindeer, bison, bears, saiga-antelopes and mammoths, so full of character and life, drawn, painted, carved by stone-age man in the caves he inhabited? In the cavern of Mas d'Azil, Ariège, France, was found a wonderful head of a neighing horse carved in the



Head of horse carved in reindeer's antler from the cavern of Mas d'Azil, Museum of St. Germain.

round out of reindeer's antler. It breathes the spirit of Attic art at its best; it is the work of a French artist of fifty thousand years ago!

These mighty Ancients established our laws, set up the family and founded the State; they believed in a life after death and worshipped an unknown and unknowable creative God whose images and emblems were the things that most appealed to the imagination: the patriarch, the thunderbolt, the soaring eagle, and above all the dazzling, life-raising sun which fired their heavens at morn and even. Call it all empiricism, if you will, but forget not that whilst the Ancients had none of your "science" to guide them, you had all their "guesses" at your service.

Stay! tell me, what would man's surroundings be now if all that the Ancients taught him were blotted out?

How true the words of the preacher:—

"The thing that hath been, it is that which shall be; and that which is done is that which shall be done; and there is no new thing under the sun.

"Is there any thing whereof it may be said, See, this is new? It hath been already of old time, which was before us.

"There is no remembrance of former things; neither shall there be any remembrance of things that are to come with those that shall come after."

Several authors, no doubt copying from one another, have attributed to William Harvey the dictum: "*Omne vivum ex ovo*" and, indeed, though believing in spontaneous generation, Harvey, in his "*Exercitationes de Generatione Animalium*" (1651), does say: "*Ovum esse primordium commune omnibus Animalibus*." Yet the principle thus enunciated is neither original nor correct. In his *Symposiaca*, Plutarch tells us that Alexander the Epicurean having asked "that perplexed question, that plague of the inquisitive": "Which was first, the bird or the egg?" Firmus answering, said: "Let us consider the various kinds of animals and we shall find almost every one beginning from an egg." However, whilst recognizing that most animals arise as the result of pairing among pre-existing animals of the same species, the Ancients readily admitted abiogenesis—that is to say, spontaneous generation from non-living matter for such animals as frogs, field-mice and locusts, which suddenly appear, at times, in prodigious numbers; for maggots, tapeworms and other helminths which live parasitically within other animals or in plants, and for a few fish, such as eels, which conceal themselves in mud.

"No one ever found the spawn or egg of an eel," says Senecio, "yet if you empty a pit and take out all the mud, as soon as other water settles in it, eels likewise are presently produced." The observation was correct and what else then could explain it but spontaneous generation? Until quite recently neither the fully mature nor the earliest stages of the Common Eel (*Anguilla vulgaris*) were known. It was known that in April and May young eels ("elvers") swim up rivers in countless myriads, often reaching small distant ponds by travelling overland at night, and that, after a period of growth (about six years) the "yellow eels" suddenly become excited, don bridal dress of silver-white and hurry down to the sea to breed. But the sexes seldom were distinguished, mature specimens with developed milt or roe being found but rarely. Having reached the sea, the "silver eels" continue to travel far down the Atlantic slope until they reach great depths, there to spawn and perish. It was only in 1896 that the larval forms were discovered in the Straits of Messina by two Italian naturalists, Grassi and Calandruccio. The eel-fry are tiny, colourless, leaf-shaped creatures ("*Leptocephali*"), clear as glass, with small head and jet-black eyes, which alone can be seen strangely ogling within the jar of seawater containing the ghostly things. When about three years old these leptocephali contract into

yellowish cylindrical forms (elvers) the size of darning needles and swim up the rivers, where, con-founded with bits of hair or gordian worms, the country folk will tell you that they fall off stallions' tails or drop out of the bowels of water-insects. Indeed, in Sardinia, a water-beetle (*Dysticus roeselii*) frequently infested by Gordius, is called the "Mother of the Eels."

Though the theory of the spontaneous generation of eels runs throughout the centuries from Aristotle to Izaak Walton, yet some doubted it in ancient times. Thus, in his famous poem on fishing, Oppian, a Greek author of the second century A.D., actually describes the eels spawning.

More surprising, often childish, are the examples of spontaneous generation given by the learned men of the Renaissance.

The Duckweed (*Lemna*) in summer overspreads stagnant waters with a green carpet of rapidly budding fronds and is conveyed from pool to pool clinging to the legs of water-birds or to the elytra of water-beetles. The Italian botanist, Pietro Andrea Mattioli, looked upon the *lemna* carpet as a condensation of the surface film, and suggested that it might be the starting point of higher forms of life. The celebrated English philosopher, Francis Bacon, had no hesitation in believing that some of the higher plants, such as thistles, might arise spontaneously from dead matter. Van Helmont is amazingly credulous. Following the elder Pliny, a master in gullibility, he tells us that mice can be spontaneously engendered by the simple device of placing some soiled linen in a convenient receptacle, together with a few grains of wheat or a piece of cheese. He also gives directions for the obtaining of scorpions: "Scoop out a hole in a brick. Put into it some sweet basil, crushed. Lay a second brick upon the first so that the hole may be perfectly covered. Expose the two bricks to the sun, and at the end of a few days the smell of the sweet basil, acting as a ferment, will change the herb into real scorpions." Both recipes are excellent and, I may add, from my own experience: *probata sunt*. I know of no better mouse-trap than a large pickle-jar with a layer of rice or wheat grains at the bottom and a perforated paper cover over the mouth, while who knows not that scorpions, house-bugs and other small deer readily take cover between fissures in timber or stone?

Milton in his wonderfully written story of the creation in "Paradise Lost," portrays the tawny lion pawing himself out of "the grassy calving clods," but few ever entertained a belief in the spontaneous generation of the larger animals, common though this belief was with regard to parasitic worms and flesh or fruit maggots. If not of spontaneous generation, how else could one explain the appearance of worms not only in closed body cavities, but within the very substance of the internal organs; how else explain the presence of grubs in the cores of apples and other fruit showing no external mark of injury?

Three great Italian naturalists, Redi, Vallisneri and Malpighi, explained the mystery.

Francesco Redi, physician to Ferdinand II, Grand Duke of Tuscany, and to his son and successor, Cosimo III, was a very able clinician, a charming poet and a naturalist of great merit. His works on "The Poison of Vipers," "The Generation of Insects," and on "Animals that live within other Living Animals," are famous. It was he who showed that flesh maggots do not arise spontaneously in decaying flesh, but are the progeny of blow-flies and carrion-flies, which deposit their eggs or larvæ on dead animal matters. The maggots which issue from these eggs, having attained full growth, pupate; while out of the pupa cases eventually emerge flies similar to those which laid the eggs. Redi captured flies which were laying their eggs on putrid flesh, dissected them, and found similar eggs still present within their generative organs. Then he spread wire-gauze over tainted flesh and flies, attracted by the noisome odour but unable to reach the flesh, left their eggs on the gauze and he observed that no maggots formed on the flesh. This was the first hard blow given to the theory of spontaneous generation.

Then followed the researches of Antonio Vallisneri and of Marcello Malpighi, which explained how the eggs of insects are introduced into fruits and plant-galls, how maggots reach the frontal sinuses of sheep, and how helminths are produced from eggs laid by parent animals of the same species. Thus spontaneous generation was disposed of for all the then known animals and plants. These discoveries were followed by the researches of Swammerdam, Pallas, Müller, Bloch, Göze, Rudolphi, Bresmer, Mehlis, Von Siebold, Steenstrup, Dujardin, Küchenmeister, Leuckart, Cobbold and many others, which raised parasitology to that eminence it had attained at the time when Pasteur began his medical investigations.

But in the latter part of the seventeenth century, when, by means of his improved microscopes, Leeuwenhoeck disclosed that vast world of the infinitely minute (bacteria, protozoa), long suspected, but actually known only through a few of its larger forms (moulds and yeasts), the question of spontaneous generation rose again in an aspect far more formidable. It was resuscitated in 1748 by the Irish priest and microscopist, John Tuberville Needham, who had enclosed vegetable infusions in well-corked flasks sealed with mastic, and subjected them to heat "merely the time which is required to cook a hen's egg and destroy the germs"; then, after allowing the vessels to cool, in a few days he had found them teeming with microscopic organisms. These he concluded could only have come into being by virtue of spontaneous generation.

Lazzaro Spallanzani, an Italian physiologist, geologist, physicist and investigator of singular power, in 1765 repeated Needham's experiments with stricter precautions. He sealed his flasks by fusing their necks in the flame of a blowpipe and submitted them to a thorough sterilization by boiling. "I used," he says, "hermetically-sealed vessels. I kept them for an hour in boiling water, then, after a reasonable time, opening them and

examining their contents, I found not the slightest trace of animalcules, though I had examined with the microscope the infusions from nineteen different vessels."

Needham replied that from the manner Spallanzani had treated and tortured his nineteen infusions, it was evident that he had not only weakened, or perhaps totally destroyed, their vegetative force, but also corrupted the small portion of air which remained in the empty part of his vessels. Thus treated, was it any matter of surprise that his infusions should give no sign of life?

Spallanzani at once overthrew these objections by showing that the boiling had not destroyed the presumed "vegetative force," since his sterilized infusions invariably became full of micro-organisms after renewed exposure to the air. He found two defects in Needham's work: insufficient sterilization and contamination through defective sealing; at the same time he pointed out that some micro-organisms were capable of resisting the temperature of boiling water. His experiments proved the fallacy of spontaneous generation.

After Spallanzani the question took a new turn. It was objected that life could not be expected in the absence of oxygen. This objection was met first by Franz Schultze (1836), who introduced air into flasks containing boiled putrescible liquids by drawing it through sulphuric acid in order to destroy suspended micro-organisms; then by Schwann (1839), who boiled his infusions, but left the flasks open and communicating with the surrounding air by means of long glass tubes bent in the shape of the letter U, and heated by passage through a bath of fusible alloy. Helmholtz (1843) repeated Schwann's experiment with calcined air and arrived at the same result. Finally, to avoid the objection that air subjected to heat or to the action of chemicals might have undergone some change preventing the process of fermentation, Schroeder and Von Dusch (1854) thought of the simple device of filtering the air through cotton-wool. Already Loewel had found that air, when filtered through cotton, was incapable of causing crystallization of super-saturated solutions of sodium sulphate. By means of a loose plug of cotton, through which free communication with the external air was maintained, Schroeder and Dusch excluded all suspended micro-organisms, and the filtered air did not ferment their boiled putrescible liquids. Thus came into use the cotton plug which has proved of so much value and universal service in bacteriological research. Hermann Hoffmann subsequently proved that to prevent fermentation in a boiled fluid, nothing more is necessary than to bend downwards the neck of the retort so that nothing can drop into it from the air.

Meanwhile Treviranus, Ehrenberg and others pointed out that the micro-organisms of infusions differed specifically from one another, and that they multiply not only by fission and budding, but also by means of eggs or spores.

The belief in spontaneous generation almost seemed a thing of the past when Pouchet once more sent it rolling at the ninepins of the *Académie des Sciences*.

Pouchet's method of experiment consisted in taking a flask filled with boiling water, sealing it hermetically, then plunging it upside down into a basin of mercury. When the water had cooled, he opened the flask under the mercury and introduced into it successively oxygen and nitrogen in the proportions necessary to form an atmosphere of artificial air, also a small quantity of hay previously exposed to a temperature of 100° C. for twenty minutes. Pouchet was convinced that he had removed satisfactorily every loophole for the admission of living things into his flask, and yet the hay infusion soon teemed with micro-organisms. Whence came they? It could not be from the air, because the flask contained none; they must perforce be of spontaneous origin.

"It is from the mercury that your germs come," answered Pasteur. "I will show you how the rats entered Van Helmont's pot. The mercury in a laboratory bath is constantly exposed to the dust from the air and always contains some. The special lightness of the dust particles would only bring them to the surface of the mercury if they were of a definite size. Besides, if there were none at the bottom, if they were only on the surface of the mercury, it would still not be possible to avoid them during the operation. Spread some dust on the mercury and then plunge a glass tube into it. The dust seems to be attracted, and you see it collect by degrees in a sort of layer which forms between the glass and the mercury. Sink the tube a decimetre or more, the dust will follow to this depth." Pasteur then gave a direct proof of his explanation. A globule of mercury taken from the laboratory bath and introduced into a putrescible liquid always gives rise to organized growths; however, if we repeat the experiment under the same conditions, but with mercury previously heated, nothing grows.

Pouchet and his supporters, Joly and Musset, rejected Pasteur's criticism and maintained that, as Gay-Lussac had pointed out, decomposition depended upon the presence of oxygen. "If," urged Pouchet, "decomposition were due to micro-organisms present in every bubble of air, why then the atmosphere, thick with germs, would have the appearance of a London fog—nay, it would have the density of iron!" But Pasteur explained that the air varies greatly in its richness as regards germs, and pointed out that whilst contamination is almost the rule in the atmosphere of a crowded town, it seldom occurs at great altitudes as, for instance, at Montanvert, close to the Mer de Glace, where of twenty broth-flasks which he had opened and re-sealed only one subsequently exhibited germ life. But Pouchet and his friends climbed the Maledetta and there opened their infusion-flasks, in the crevasse of a glacier, with the result that all soon swarmed with micro-organisms. "There."

said Pouchet, "Pasteur brought back sterile flasks from Montanvert, but the peaks of Aragon, far higher and wilder than the ladies' favourite Mont Blanc, have given him the lie direct!" Then both sides demanded that the Académie des Sciences should appoint a Committee, before whom should be repeated the experiments upon which were based the contradictory conclusions of the two parties. The appointed Committee consisted of Flourens, Dumas, Brongniart, Milne-Edwards and Balard, but on the day of trial Pouchet and his friends withdrew, leaving Pasteur triumphant. This was a great mistake on their part, because, as we know now, both sides would have been successful in their respective experiments and Pasteur would have been baffled at the time by the results of his adversaries, as he was later, in 1876, when Dr. Henry Bastian of University College confronted him.

"You maintain," said Bastian, "that urine boiled and preserved in the presence of superheated air remains clear and sterile because you have allowed no germ to penetrate there. I say, on the contrary, that the germs have nothing to do with it and that the sterility of the liquid is due only to the fact that, in spite of all your care and dexterity, you have not known how to reunite in it the physical and chemical conditions necessary for spontaneous generation. The proof of it is this: if I saturate this urine with a little potash boiled and freed from germs, so as to render the urine neutral, or a little alkaline, and if I put it, furthermore, not in one of your ovens where it is not sufficiently hot, but at 50° C., this same flask of urine which remains sterile in your hands becomes clouded at the end of nine or ten hours and swarms with bacteria. From whence can they come, if not from a spontaneous generation?"

Pasteur at once repeated Bastian's experiment and was obliged to acknowledge that the germs were there right enough, but whence came they? Were they in the potash solution? If so, in the water, not in the potash, because fused potash in the solid state destroys everything living, whilst germs always are present in water, even in distilled water when, as pointed out by Burdon Sanderson, it has been collected in receptacles washed with water containing germs. Yet, repeating the experiment with a thoroughly sterilized potash solution, the urine clear and sterile up to that time, becomes clouded and full of living things. It is the urine, therefore, thought Pasteur, which supplies the germs and, obviously, the boiling to which they have been subjected has not been powerful enough to destroy them. He then submitted the urine with potash solution to a temperature of 120° C. and succeeded in sterilizing it.

Bastian's conclusion was at fault, but his ingenious experiments and his persistent objections forced Pasteur to elucidate the minutest details and thus proved of great value to science. To these researches we owe Chamberland's filter, the autoclave, and much of our present bacteriological technique.

"Where you see nothing develop," says Bastian, "you say there is nothing, but without your knowing it, there is something of which you prevent the evolution." Pasteur succeeded in proving that this "something" is life in its minutest specific forms, but Bastian's researches had shown that the "success" of many experiments in the past had been only apparent, not real: the germs were there, and they or their spores had resisted the temperature of boiling point, though placed in acid media and deprived of oxygen they had failed to develop.

Pasteur set to work and unravelled the mystery. Already he had observed that milk curdles or putrefies under conditions where meat broth, the must of beer and other infusions remain unaltered; also he had found that the greater resistance to heat exhibited by germs in milk is due to the fact that fresh milk is slightly alkaline. A decoction of yeast, which when slightly acid is easily sterilized by a short boiling at 100° C., needs to be heated to 105° C. or 110° C. when rendered alkaline by the addition of a small amount of carbonate of lime. He had observed also that germs in the dry state, adhering to the walls of flasks, resisted heat far better than when immersed in liquids and required a very high temperature for their destruction, hence the flaming of all bacteriological receptacles came into use. Finally he discovered that hay infusions, such as were used by Pouchet, Joly and Musset in their experiments, were not easy to sterilize, because of the almost constant presence of *Bacillus subtilis*, one of the most resistant of organisms, the spores of which can withstand boiling for several hours without being killed. Then Pasteur must have laughed at his luck that Pouchet and his friends, uncertain of their results, had withheld from the contest before the Académie des Sciences at a time when he had not yet discovered this fact. Thus Pasteur reached a conclusion already stated long before by Spallanzani and Bonnet that there are organisms capable of resisting the ebullition temperature, but that so far no one has ever been able to prove the spontaneous origin of life. In a lecture on Spontaneous Generation given at the Sorbonne in 1864, after describing his experiments up to date, Pasteur exclaimed:—

"What a victory, gentlemen, what a victory for materialism, if it could affirm that it was based on the proved fact that matter can of itself become organized, take life by itself, matter which has already in itself all the known forces! Ah! yes, if we could only add that other force called life—life varying in its manifestations with the conditions of our experiments, what more natural than to deify matter? What good then to go back to a primordial creation before the mystery of which we can only kneel? What good the idea of God the Creator?"

SILKWORM DISEASES.

Whilst deep in his studies on fermentation, Pasteur was asked by his friend and former teacher, the Senator Dumas, to undertake, on behalf of the French Government, the investigation of pébrine.

Pébrine¹ was a silkworm disease which, since 1849, had been killing the silkworms and destroying the silk industries of France. In the space of twelve years, the annual revenue to the State from this source had been reduced from 130,000,000 to 8,000,000 francs. In Italy, where the disease affected a much more extended industry, the disaster had been appalling.

"But consider," said Pasteur, in answer to Dumas' insistence, "that I have never handled a silkworm." "So much the better," replied the latter; "knowing nothing of the subject, you will be guided by your own observations instead of following preconceived ideas." Pasteur yielded and spent six years at this work.



The Chinese silkworm.

Pébrine had been studied already in France, Italy, Germany and other countries by numerous investigators such as Guérin-Mèneville, De Filippi, Cornalia, Osimo, Cantoni, Ciccone, Vittadini, Frey and Lebert, Viacovich, de Quatrefages, Peligot and others, who had accumulated a vast amount of useful information. Guérin-Mèneville and De Filippi had noticed the specific organism (*Nosema bombycis*); Cornalia not only had described it very accurately but had fully apprehended its pathogenic importance; Lebert and Frey had pointed out the great abundance of Cornalia's corpuscles in all the diseased moths; Osimo of Padua had found these organisms in the moth's eggs and thus was the first to discover the hereditary transmission of disease-germs through the egg, and both he and Vittadini, in 1859, had suggested submitting the eggs of the *Bombyx* to a microscopical examination for detection of the pébrine corpuscles so as to ensure the elimination of the disease. Meanwhile, various endeavors had been made to combat the infection by means of isolation, cleanliness, ventilation and disinfection. And much more should we learn were our retrospective investigations to lead us back to China, where the silk industry first arose more than four thousand years ago.

And what a remarkable industry! Think of it, the domestication of a wild insect of the woods now giving employment to millions of people throughout the world, and the golden product of its spinnerets used first to make chords for the Kin or "scholars' lute" (earliest of stringed instruments, loved of Confucius), then woven into the most gorgeous of fabrics, wherewith to provide

imperial robes of ceremony, and finally turned into the softest, lightest of textiles² which, "though covering woman yet reveals her charms," a tissue of "woven mist" as it is called in Sanskrit literature.

The care bestowed upon the cultivation of the mulberry silkworm (*Bombyx mori*) in China truly is amazing. It is woman's work, patient, intelligent, tender, solicitous, persevering. It results in an annual production of raw silk exceeding 120,000,000 lb. The Chinese attribute to Lei-tsu, wife of the Emperor Huwang-ti, the invention of reel and loom. Whether this be so or not, the willowy Empress with soft, limpid, clear-cut almond eyes and scarlet lips, carefully hatching the eggs of the silkworm moth inside the garment next her skin, white like jade, is a charming personification of the great silk industry. All honour to the "Lady of Si-Ling"!

During the first two years of his investigation Pasteur found nothing new, and, disappointed, harassed, worried, he would exclaim repeatedly: "Hélas! Nous n'avancions pas!"

He had no difficulty in finding the large bright oval corpuscles described by De Filippi and Cornalia, but he could not bring himself to recognize these bodies as the real cause of pébrine. Sometimes he found them in large numbers, at other times not one could be detected in the dying caterpillars. One day, at last, he understood. Calling his assistants together, he told them they were dealing with two diseases, not one, both equally deadly to the silkworms. One of them was pébrine right enough, Cornalia's corpuscles invariably being present; the other was the so-called Flacherie or "maladie des morts-blancs," caused by a very different micro-organism (*Streptococcus bombycis*), discovered by Béchamp in 1867. Like Osimo and Vittadini, so also Pasteur urged the rearers of silkworms to employ the microscope in detecting these diseases and in separating sound from infected eggs and, anticipating objection, said: "Should you fear being unable to manipulate the microscope, know ye that I have a little girl but eight years old who makes very good use of it." Pasteur's views on the causation of silkworm disease and the measures he proposed for their prevention met with so much opposition at first that the French Government hesitated to give them official recognition. But Marshal Vaillant, Minister to the Imperial Household, who had followed Pasteur's researches with the interest of a true naturalist, came forward with the suggestion that an experiment be made at a villa near Trieste, belonging to the Prince Imperial. Here, during the preceding ten years, the cultivation of the silk *Bombyx* had failed completely. Pasteur accepted

¹ The name pébrine, from the provincial term pebre (pepper), was given by de Quatrefages in 1859 on account of the dark spots resembling pepper grains which maculate the skin of the diseased caterpillars.

² Aristotle tells us how Pamphile of Cos made gauzy garments out of Chinese raw silk bobbins, and Lucan, in his "Pharsalia," describes Cleopatra, "her white breasts resplendent through the Sidonian fabric, which, wrought in close texture by the silk of the Seres (Chinese), the needle of the workman of the Nile has separated and has loosened the warp by stretching out the web."

the offer with gratitude, and the success of his experiment was so great that the sale of the resulting cocoons realized a profit to the estate of 22,000 francs.

On April 11, 1870, at the Académie des Sciences, Dumas formally and enthusiastically related Pasteur's results in the investigation of silkworm disease, and in the following July Pasteur was nominated a Senator by Napoleon. Meanwhile, in 1868, the Austrian Government had awarded him the prize of 5,000 florins offered for the discovery of the best means of combating pébrine and in 1869 he had been elected a foreign member of the Royal Society of London.

From the investigation of silkworm diseases Pasteur turned once more to the study of fermentations and, between the years 1871 and 1876 in a patriotic endeavour to serve his war-exhausted, overburdened country, he investigated the fermentations connected with the brewing of beer. His purpose was the improvement of the manufacture of French beers in order that they might compete successfully with those of Germany and thus aid in bringing prosperity to France. Soon, however, the silkworm researches having shown that in the diseases of animals and man there were far more pressing and important fermentations to be elucidated and conquered than those of alcoholic beverages, Pasteur followed this path. His penetrating, scrutinizing eyes turned from flasks containing blood-red claret to others filled with claret-red blood.

ANTHRAX.

In his "Etudes sur la Bière" Pasteur says: "The ætiology of contagious diseases is on the eve of having unexpected light shed upon it." Thus, in Pasteur, was verified a prophecy made more than two centuries ago by Robert Boyle, a celebrated



Bacterium anthracis.

Irish chemist and natural philosopher, who wrote: "The man who shall probe to the bottom the nature of ferments and of fermentations will, doubtless, be much more capable than any other of giving a true explanation of the divers morbid phenomena, both of fevers as of other affections."

In 1876, we find Pasteur at Chartres studying anthrax on behalf of the Ministry of Agriculture. This disease, of world-wide distribution, which frequently gives rise to deadly epizootics among cattle, sheep, horses, pigs, and rabbits, is communicable to nearly all warm-blooded animals and man. Called "ignis sacer" by Lucretius,

"pustula" by Columella, and "Persian fire" by the Arab physicians, it is known to us by the names of malignant pustule, splenic fever and wool-sorter's disease. Virgil describes the appearance of deep boils on the skin of man from wearing the hides or the wool of stricken sheep.

The causal agent of anthrax (*Bacterium anthracis*), "a small thread-like body about twice as long as a blood corpuscle," had been discovered by Rayer and Davaine in 1850. Pollender again described it in 1855, but it was not until 1863 that Davaine, inspired by Pasteur's work on fermentation, realized all the importance of his discovery, asserted the rod-shaped organism to be the true cause of anthrax, was able to transmit the infection from affected to sound animals, and showed that the course of the malady depends greatly on the number of bacteria inoculated.

Davaine's results were attacked and for ten years a fierce controversy raged until Robert Koch (1876) published his experiments. Koch cultivated the bacterium of anthrax from the blood, showed that the inoculation of these cultures in susceptible animals produced anthrax, worked out the life-history of the organism, drew attention to the importance of the spores which invariably form in the blood and tissues of animals dead of anthrax—provided the temperature is suitable and there is sufficient oxygen—and enunciated the cardinal requirements which constitute the proof of the pathogenic nature of the organism, what later bacteriologists have named the rules or postulates of Koch.

The contributions made by Pasteur and his devoted fellow-workers, Chamberland and Roux, to our knowledge of anthrax are many and great, but here I can mention briefly only the imposing experiment by means of which, as was his wont, Pasteur not only definitely proved the parasitic nature of anthrax, but the possibility also of preventing this deadly plague by means of its own enslaved causal agent.

By cultivating anthrax bacteria in the presence of air at a temperature of 42° to 43° C., Pasteur had succeeded in attenuating their virulence and preventing the formation of spores. By inoculating cultures thus debilitated and no longer able to kill, he had rendered sheep immune to copious and deadly injections of the healthy, fully virulent organism. These protective methods and their good results were communicated to the Académie des Sciences on February 28, 1881. Soon afterwards the President of the Agricultural Society of Melun approached Pasteur and proposed that the learned gentleman should make an experiment in public to demonstrate convincingly the value of his preventive methods. Pasteur gladly accepted the challenge, so it was arranged that twenty-five sheep, after being protected by means of attenuated cultures, should be inoculated with virulent anthrax, a similar dose of these very cultures being injected also, at the same time, into other twenty-five non-vaccinated sheep which would serve as

controls. In accordance with his published statements, the first set of sheep should resist the inoculation of virulent anthrax, whilst the second must succumb to it inevitably.

The experiment took place at Pouilly-le-Fort, near Melun, on the estate of M. Rossignol, a veterinary surgeon, who first suggested it. It was followed with the greatest interest and excitement by numerous agriculturists, veterinarians, physicians, journalists and others who, having little faith in the new doctrines, certainly expected failure, more especially as Pasteur, enticed out of his magician's laboratory, was compelled to work in the open. Pasteur's assistants were somewhat anxious at the time of the experiment lest some unforeseen accident should mar success, but the master rebuked them. "What has happened to twelve sheep in the laboratory," said he, "why should it not happen also to fifty sheep in the field?" He was right, and the experiment proved it indubitably.

THE ATTENUATION OF VIRULENCE.

It was whilst investigating "Chicken Cholera," a disease of fowls caused by a minute oval organism (*Bacterium cholerae gallinarum*), described by Moritz (1869), Perronito (1878) and Toussaint (1879), that Pasteur first discovered how to attenuate the virulence of bacterial cultures. Returning to his laboratory, after a vacation, he found that his cultures of the fowl-cholera organism which had been allowed to stand without transplantation and under aerobic conditions were either dead or dying. Every endeavour was made to revive those still showing signs of life, and they were inoculated into the blood of healthy fowls. These, however, manifested no evidence of disease in consequence. Then Pasteur procured fresh material from cholera-infected fowls and inoculated it into the birds which had remained apparently unaffected by the old dying cultures. To his astonishment, nearly all these fowls survived the virulent injection, whilst others, not previously experimented upon, developed the disease and died.

Convinced that this was a matter of importance and that he was on the threshold of a great discovery, Pasteur repeated the experiment in various ways, then realized in a flash that one of his dreams, the immunization of animals and man against disease, had come true. Long had he pondered over vaccination, long had he wished he could emulate Jenner and, with like weapons, combat other great disease scourges. At a meeting of the International Medical Congress, held in London in 1881, he said: "I have given the term vaccination a wider extension, which I trust Science will consecrate in homage to the merit and achievements of one of England's greatest men—Jenner."

Fully recognizing Jenner's great service to mankind in spreading throughout the world the practice and benefits of vaccination, a method of protection against smallpox which, in his youth, he had seen

practised by the farmers of Gloucestershire, we should not forget that the idea of immunization against all manners of poisons and diseases belongs to the remotest antiquity, while its practice is as ancient and almost universal. Who knows not of the King of Pontus, Mithridates the Great (B.C. 120), who, having made himself proof against poisons by drinking the blood of ducks that had been treated with the corresponding toxic substances, in the end, after vainly seeking to die by poison, had to bid a soldier cut his throat? Who knows not that Early Man, in America as well as in Africa and Eurasia, used the very venom of crocodile and viperine snakes as a protection against the stab of their deadly fangs? Indeed, he used the poison fangs as inoculating needles, a contrivance lately renewed by a physician of the island of St. Lucia, West Indies, who vaccinated negro children, using as lancets the fangs of the Fer-de-lance (*Lachesis lanceolatus*). Amongst ancient surgical instruments in my possession is a bronze hypodermic needle of the Hellenistic period, found in Egypt, which is obviously a copy of a cobra's canaliculated tooth.

Of diseases long defied by the judicious inoculation of their causal germs are cattle pleuropneumonia, syphilis, oriental sore and smallpox. The custom of inoculation against the oriental sore was common among the Jews of Bagdad, the reason being to avoid facial disfigurement, therefore the artificial and protective boil was induced in childhood on the lower limbs. The artificially induced sore was not only of cosmetic value, but probably also protected against systemic leishmaniasis.

The best known and most instructive of inoculation procedures are those which have been practised from the earliest times as preventives of smallpox. Two principal methods—variola and vaccination—are known, both equally ancient. Variolation, "the sowing or cultivation of Heaven's flowers," was practised by the Chinese thousands of years ago, and consisted in the inoculation of the virus taken from the "flowers" or pustules of a mild form of the disease in an otherwise healthy child. Vaccination was known to the ancient Hindus, and consisted in the inoculation of lymph taken from the vesicles on the teats and udders of Indian humped cattle suffering from cowpox. In the Sanscrit text Sacteya attributed to Dhanwantari, the earliest known Hindu physician (c. 1500 B.C.), we read: "Take some fluid from the pustules on the udder of the cow or the arm of a human being, between shoulder and elbow, collecting it on the point of a lancet, and introduce it into the arm at the place indicated, mixing the fluid with the blood. The variolous fever will be produced, but the disease will be as mild as the animal from which it is taken. It cannot inspire any fear and requires no remedy."

During the eighteenth century we find variolation widely practised in many countries, such as Persia, Armenia, Circassia, Turkey, Abyssinia, Tripoli.

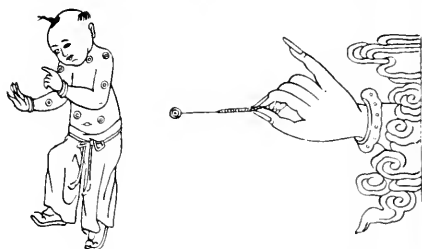
Algeria, Senegambia, Italy, France, Wales, Holland and Germany. Emanuel Timoni, a physician of Constantinople, described it in 1714 and soon after Lady Mary Wortley Montagu, the charming, accomplished and determined wife of the British Ambassador to the Ottoman Court, introduced it into England. Lady Montagu's letter to Miss Sarah Chiswell, written from Adrianople in 1717, is famous. In it we find a description of the Turkish method of "ingrafting" the smallpox; the operation is performed by old women every autumn upon thousands of people, and "the French Ambassador says pleasantly that they take the smallpox here by way of diversion, as they take the waters in other countries." At the end of her letter Lady Montagu says: "I am patriot enough to take pains to bring this useful invention into fashion in England" and assures her friend that she has the courage to war with the doctors. "Upon this occasion," says she, "admire the heroism in the heart of your friend!" And, indeed, she succeeded, supported by royalty and by the learned Dr. Mead, who in consequence first practised variolation in England in 1721. In 1746 a hospital for inoculation of the poor was built in London and the practice became popular. Robert Sutton, an unqualified practitioner, and his two sons inoculated 20,000 cases without a single death that could "fairly" be attributed to the operation. In France it was Voltaire who patronized inoculation and brought upon it the anathematization of the Church. In 1763, when the French Parliament ordered that the question as to the value of inoculation be referred to the faculties of Theology and Medicine, the sarcastic encyclopædist wrote: "You gentlemen, who are the best theologians and the best physicians in Europe, you should issue an injunction against smallpox, just as you have against Aristotle's categories, against the circulation of the blood, against emetics and quinine."

Like the practice of variolation, so also that of vaccination gradually spread from East to West. During the eighteenth century we find it in Beloochistan, in Germany, England, Ireland and France. In Europe, as in India, it had been observed that people attending cattle were liable to develop sore hands from contact with cowpox pustules on the udders of milch cows and that those who had suffered from this local affection subsequently escaped smallpox. This was known so generally that at the court of Charles I, when courtiers jestingly warned the beautiful Barbara Villiers, Duchess of Cleveland, beware lest hideously pitting smallpox turn her out of court, she made reply: "Fear not, I have had the cowpox." And there is ample evidence to prove that before Jenner's time the cowpox virus had been inoculated extensively for the express purpose of preventing smallpox. I need but mention Benjamin Jesty, the portly farmer of Yetminster, who was officially recognized by the Jennerian Society as the first person (known) to have intentionally inoculated his wife and two sons with cowpox matter in order to prevent their contracting the smallpox during an

outbreak of the latter disease in 1774, and Dr. Nash, who had long advocated the use of cowpox as a prophylactic against smallpox.

In France it was Rabaut-Pomier, a Protestant minister of Massilargues, near Lunel, who commended its use in 1784, and the Germans mention one Goëtz, who practised vaccination in 1669, and a Göttingen treatise on vaccination published in the *Allgemeine Unterhaltungen* in 1668. Jobst Böse, a Government official, in 1769 wrote: "I remember the not infrequent attacks of cowpox which prevailed in this country and to which even now milk maids are subject. And, passing, let me remark that in this country those who have had the cowpox flatter themselves to be entirely free from any danger of contracting the smallpox and assert, as I do myself, to have heard this same statement made by thoroughly reliable persons." In 1791 a school teacher by the name of Platt, in Starkendorf, near Kiel, vaccinated his landlord's children to protect them against a prevailing epidemic of smallpox. Moreover, there are Jensen of Holstein and others who likewise employed prophylactic cowpox inoculation before Jenner discovered it, but we had forgotten!

Let us consider more closely the old Chinese method of "sowing" the smallpox. In the first



Collecting "Heaven's flowers"—Chinese drawing.

place, the Chinese physicians carefully selected their material by collecting the scabs of crusting variolous pustules from children mildly affected but otherwise healthy and in good condition. They chose a favourable season, when infectious diseases were not prevalent among children, and a favourable day, when the air was dry. Having removed with every care the round, umbilicated, mahogany-tinted crusts, they dried them thoroughly and preserved them in a cool place within new porcelain vases hermetically sealed by means of tight-fitting lids and gummed paper bands. Thus the crusts underwent a period of maturation, but seldom were they kept over six months. As a rule the scabs gathered in spring were used in autumn and those of the fall in the ensuing spring. When required, the dried crusts were either pulverized and the powder blown up the child's nostrils, or else they were moistened with tepid water, mashed in a clean porcelain bowl with a rod of willow-wood to a paste neither too soft nor too dry, enclosed in cotton-wool, pressed to a pellet, and then introduced into

one of the nostrils in such a way as not to occlude it entirely. When no matured crusts were available, fresh ones were subjected to the steam of an infusion of certain herbs before use.

What could have been the object of so definite a system of preparation if it were not the attenuation of the virulence of the unknown germ? Just like Pasteur with his cultures of chicken cholera, so the Chinese, no doubt also accidentally, found that keeping, under certain conditions, first attenuated, then entirely destroyed the virulence of the small-pox "flowers" and, like Pasteur, they made excellent use of their observation, applying it with like design and skill to the benefit of mankind.

In India vaccination was performed also by means of the seton. Cotton threads were dipped in the lymph of a cowpox pustule, then dried and preserved. When required, they were put into needles and inserted beneath the skin on the outer side of the upper arm. In the Zambesi region the natives have long protected their cattle from fatal pleuro-pneumonia by inserting beneath the skin of the tail worsted threads charged with serum obtained from the lungs of heifers that had died of the disease. But the most interesting example of the use of the seton is in connection with plague. It consists in a wondrous feat—the actual pitting of a pyogenic micro-organism against the pest bacterium! We find this method of protection commended from the days of Galen to the middle of the nineteenth century. Galen believed that issues about the legs were a protection against the plague and Ambroise Paré, in the sixteenth century, following Galen, recommended that those who were not bearers of discharging ulcerations should forthwith procure them by means of cauterization. Michele Mercati, in 1576, says: "At the approach of plague many get themselves cauterized in various parts of the body, especially beneath the left knee, and keep these issues open so long as the plague lasts." At the time of the XIIIth International Medical Congress, Rome, 1893, whilst organizing the first exhibition of the History of Medicine ever held, among many interesting documents collected from the archives and libraries of Italy, I found a letter written by Senator Odescalco to his prelate brother in Rome. He says:—

"My stomach being intolerant of either pills or theriac, I have determined to adopt no other preventive measures beyond the scroful threads. These are applied by means of a well-heated sac-needle and left within; they are somewhat thicker than Genoese threads. In all cases, the threads are inserted along the septum which separates one testicle from the other. This remedy has been introduced by a German priest, who has performed the experiment repeatedly: it answers admirably, because draining from the plague all that matter that might cause suffocation, the heart is purged through the said threads and, within twenty-four hours, perfectly free. The Milanese physicians have discussed the matter and greatly praise the said threads on account of the connection they have with the heart and all such as have had them applied state that both the applying and the bearing of them is painless."

From L. Settala (Milan, 1630) we learn that these setons were made with silk threads, that they were passed through the scrofum by means of sectorium

and stile sterilized by heating, and that daily they were moved forward and backward in order to keep up a constant irritation and discharge. Settala did not consider them an unmixed blessing, because he saw fearful inflammations and gangrene result from their use. The idea originally came from the Levant and in 1812 setons and issues were still being used in Egypt, in Smyrna and Constantinople as preventives of plague.

Setons and issues are now practically obsolete methods of treatment, but in past centuries they were considered of great value as counter-irritants and most physicians believed that they drained the system of its impurities, therefore we find them more or less empirically used from Galen to Erichsen. But the explanation of their worth in plague is, I believe, far more interesting. It had been observed that with the suppuration of the buboes and the maturation of the carbuncles the patients began to convalesce, therefore every effort was made to bring about or to hasten the suppuration. By entertaining suppuration, the setons and issues stimulated phagocytosis and, no doubt, the pus-forming organisms themselves proved injurious to the plague bacterium. Indeed, not only do we now know that the *Streptococcus pyogenes* and other coccææ inhibit the growth of *Bacterium pestis*, but we have a striking analogy in the case of *Bacterium anthracis*. Enmerich showed that guinea-pigs which had resisted an inoculation of streptococcus became refractory to anthrax, and Pawlowsky noticed that previous or simultaneous inoculations of either pneumo-bacillus, streptococcus or, particularly staphylococcus, arrested the development of anthrax. Already in 1887 Pasteur had pointed out that the anthrax bacterium hardly develops in a broth which had been used for the culture of the chicken-cholera organism.

In support of the foregoing one might adduce further evidence. Thus the use of beer yeast in the treatment of furunculosis, either applied locally or given internally, is a very old remedy resuscitated by Brocq, Gordon, Turner, Hawk, Knowles, Clark and others. Hawk claimed better results with the yeast than with vaccines. The yeast secretes a toxin which has a decided bactericidal power. Experiments made by Farnbach and Walquin prove that it kills *Bacillus coli* and *Staphylococcus pyogenes aureus*.

Comte Louis Philippe de Ségur, who was Ambassador to Russia, tells us in his "Souvenirs" (1824) that a Russian physician, Dr. Samoiloff, in 1787, devised to treat the plague after the manner of smallpox and inoculate it in order gradually to attenuate its virulence. He had experimented upon himself and thus several times had contracted the disease. "Having asked the Empress Catherine II permission to generalize his experience, the good doctor, instead of pension and patent, received the reproof he deserved for his charitable folly." No doubt Ségur's Samoiloff was the Samoilowitsh who in 1782, at Strasbourg, published a pamphlet entitled "Mémoire sur l'inoculation de la Peste."

He strenuously contended for the preventive inoculation of plague over a century before Haffkine.

THE GERM THEORY OF DISEASE.

It is a mistake to believe that the germ theory of disease originated either with Pasteur or in Pasteur's time, because it is very ancient. Thirty years before Pasteur another great Frenchman, Jean Hameau, a country doctor of la Teste, Landes, who first discovered pellagra in France, had written a work, "*Etudes sur les Virus*" (*Revue Médicale*, 1817), in which, by observation, learning and clear cogent reasoning, he declared the animate nature of disease causation. In 1840 Henle, a celebrated German anatomist and microscopist, had proclaimed the animate theory of disease even more forcibly; he had pointed out the bacteria among the organisms capable of giving rise to disease and had anticipated Koch's postulates, stating that it was not sufficient to find micro-organisms in certain diseases, but that they must always be present in such cases and, further, that they must be shown to be capable actually of producing the disease.

Reascending the great river Time, we come across numerous authors who were keen-sighted enough correctly to observe and rightly interpret the many signs by which Dame Nature has indicated that disease is the work of living things. Only five years before Henle, a famous Italian, Agostino Bassi, had published a work on the silkworm disease, describing the micro-organism he had discovered to be the cause of muscardine. Therein he says:—

"This work of mine should interest not only the breeder of silkworms, but also all such as cultivate the natural sciences. . . . Not only do I hold that contagious diseases such as smallpox, plague, &c., are produced by vegetable or animal parasite organisms, but also that many—if not all—skin diseases are due to the same cause; indeed, even gangrene is caused by such entities. . . . Observation and experiment show that all contagious diseases disappear or cease to act in the individual whom they attack, when agents or means are employed which are capable of destroying the life of animal or vegetable organisms of the lowest classes, the producers, so to speak, of contagious diseases. . . . Hydrophobia, Arabian smallpox, Asiatic cholera, and other contagious diseases, caused by the agency of parasites, disappear or cease to act with the use of substances or agents capable of killing these parasites."

Bassi's work on silkworm disease was known to Pasteur of course, and one can see clearly how the words of the great Italian physician fired his imagination and influenced his researches.

But Bassi himself had borrowed his ideas about contagion, for no one ever begins his own work; we are all debtors to the past, pure originality does not exist, and we all must quote. Plenciz, a Viennese physician, writing in 1762, not only expressed a belief in the direct aetiological connection between micro-organisms and some diseases, but maintained that each malady had its own specific causal agent, which, multiplied enormously in the diseased body, was capable of reproducing outside the body and might be conveyed from place to place by the air. The famous Jesuit, Athanasius Kircher, endeavoured

to discover the causal agent of plague by examining the pus and secretions of plague patients under the low-power microscopes of his day. In his work on Plague (Rome, 1658) he says:—

"Plague is in most cases a living being; for the sick man harassed by pestiferous virulence soon contracts a marvellous putrefaction which we have shown to be most apt to create worms. Now these worms propagators of the plague are so small, so light, so subtle, that they elude any grasp of perception, and can only be seen under the most powerful microscope. You might call them atoms, but they spring up in such numbers that they cannot be counted."

Nor should we forget Girolamo Fracastorio, a poet and physician of Verona well known for his poem on Syphilis, but whose greater merits in physics, chemistry, geography, cartography and medicine place him in the very vanguard of scientific investigators. During the Council of Trent, which he attended in 1545 as ordinary physician to Pope Paul III, he wrote a treatise on Contagious Diseases which is well worth reading.

"What characterizes the pestilential fevers," he says, "is neither the greater putridity, nor the location about the heart, but the infinitely small, which come not within the grasp of our senses and either have birth within our body, or are brought to it from without, infect it and reproduce a disease exactly like in another."

In reading Fracastorio we almost think we are reading Pasteur.

"Wine may become putrid," he says, "then it has a bad smell and becomes undrinkable; it may also change into vinegar, thus giving rise to a new body with its own taste, odour and combination. Well, in contagion something analogous takes place. The germs give to the malady its characteristics, differing from ordinary putrefaction just as vinegar differs from putrid wine."

Like Pasteur, so also Fracastorio had studied fermentations. In 1534 he had written a book entitled "*De vini temperatura sententia*." The analogy to Pasteur is remarkable.

Many more authors might be mentioned and quoted who, throughout the ages, expressed their belief in the animate nature of disease causation. Why, the very goblins and pixies of folklore which soured milk, spoiled meat and induced galls in plants, the very demons which had to be cast out of the body by exorcism, like field mice and locusts from the land, were but personifications of disease-causing organisms.

Let us get right back to the Roman period, and we shall find the same ideas clearly stated by Palladius, Columella, Vitruvius and Varro. Marcus Terentius Varro, a famous scholar of the first century B.C., in his book on Husbandry, warns us that in certain marshy places

"grow animalcules invisible to our eyes which, entering with the air through mouth and nostrils, penetrate into our body and give rise to grave diseases."

That the ancients should believe in a *contagium vivum* is but natural. They were in constant touch with Nature, they were keen observers, their intellect was wonderfully penetrating, and, though they argued much by analogy, experiment was not unknown to them. Was not Galen a very father of experimental medicine? Could the unexcelled

results of ancient industry have been obtained without patient and laborious experimentation? But analogy judiciously applied is a very good hound in the hunt for truth. Let me give an example: The malaria parasites were first recognized under the microscope in 1880 by Alphonse Laveran, a French army surgeon, in the Military Hospital of Constantine, Algeria. Yet Rasori, in a discussion with Agostino Bassi half a century before, says:—

"For many years I have held the opinion that the intermittent fevers are produced by parasites which bring about a paroxysm in the act of their reproduction, this occurring at more or less short intervals according to the species

Laveran, who had been watching the parasites keenly for over thirty years, obstinately held that there was but one species until finally persuaded by the results of the Campagna experiment of 1900; whilst Rasori, who never saw them, correctly maintained with Hippocrates and Celsus, the plurality of species and correlated the variously-timed fever paroxysms induced by each kind with the asexual multiplication periods of their respective parasites. The analogy between the malaria parasites sporulating within the blood-stream at regular periods and the budding and propagating of water weeds in brooks and ditches each spring was obvious.

We can go back still farther and get a better insight into the main facts which led to the development of the parasitic theory of disease. Thus, the Ebers papyrus (circa 1550 B.C.) shows that the ancient Egyptians rightly attributed the uña disease (Egyptian chlorosis or endemic anemia) to the Heltu worm, rediscovered by Dr. Angelo Dubini in 1843 and named by him *Agchylostoma duodenale*. The Guinea worm (*Dracunculus medinensis*) and the method of removing it by gradually twining it round a twig were well known to the Hebrews, who suffered greatly from "fiery serpents" in their limbs whilst tracking along the shores of the Red Sea. There the disease was well known, as we learn from the Greek geographer Agatharchides, quoted in Plutarch's "Symposiaca." The ancient Greeks were acquainted with the parasitic nature of several diseases; I need but mention "measels" in the hog and scabies in man. From "The Knights" of Aristophanes and from the natural history writings of Aristotle we learn that hog "measels" was diagnosed by looking for the cysticerci on the visible mucosæ, and especially on the under surface of the tongue about the *frenum*, a method still in use at the present day. The history of the itch-mite (*Sarcoptes scabiei*) is most instructive. Described by Aristotle in the third century B.C., the *Sarcoptes* was redescribed by the Arab physician Avenzoar in the twelfth century, mentioned by the famous abbess Hildegard in 1200 in her *Physica*, or *Materia Medica*; then again repeatedly described and figured by many naturalists and physicians, such as Scaliger, Aldrovandus, Mouffet, Bonomo, Cestoni and by Linnæus, who in 1734 named it *Acarus humanus*

subcutaneus. Yet, strange to say, in the nineteenth century the psoric acarus was clean forgotten by physicians, who explained the disease by their crass humoral theories up to the year 1834, when a Corsican medical student, Francesco Renucci, hearing the existence of the acarus denied at the Saint-Louis Hospital in Paris, proposed to show it forthwith and extracted it from beneath the epidermis of a patient with the point of a needle, as he had seen the peasant women of his country do many a time!

It would take long to mention all the parasitic metazoa and protozoa, all the pathogenic fungi and bacteria discovered prior to the time when Pasteur began his researches into the causation of disease. A mere list of the names of parasites affecting man must suffice. Among Cestodes: *Dibothriocephalus latus*, *Tænia solium*, *Dipylidium caninum*, *Tænia saginata*, *Echinococcus granulosus*, *Hymenolepis diminuta*, *H. nana*, and *Davaincia madagascariensis*. Among Trematodes: *Fasciola hepatica*, *Heterophyes heterophyes*, *Schistosoma hæmatobium*, *Clonorchis sinensis*, *Gastrodiscus hominis*. Among Nematodes: *Ascaris lumbricoides*, *Dracunculus medinensis*, *Trichuris trichiura*, *Oxyuris vermicularis*, *Loa loa*, *Filaria bancrofti*, *Agchylostoma duodenale*. Among Acarina: *Sarcoptes scabiei*, *Demoder folliculorum*, *Linguatula serrata*, *Porocephalus armillatus*. Among Protozoa: *Trichomonas vaginalis*, *T. hominis*, *Balantidium coli*, *Giardia intestinalis*, *Spiroschaudinia recurrentis*, *Loocchia coli*, *Isospora hominis*. Among Fungi: *Microsporion audouinii*, *Trichophyton tonsurans*, *Achorion schoeleinii*, *Monilia albicans*, and *Nocardia bovis*. Among Bacteria: *Bacterium anthracis*, *Mycobacterium lepræ* and *Diplococcus gonorrhææ*.

To this list must be added the numerous causal agents of diseases in animals and plants known before 1880 and the epoch-making discoveries of the fosterage and transmission of disease-causing organisms by other animals, such as the fosterage of *Dracunculus medinensis* in certain species of *Cyclops* by Fedchenko in 1871; the fosterage of the larval stages of *Fasciola hepatica* in the freshwater snail *Limnia truncatula* by Weinland in 1873 and the fosterage and transmission of *Filaria bancrofti* by *Culex fatigans* discovered by Manson in 1877.

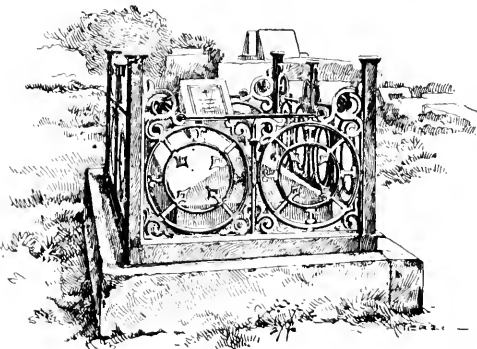
Pasteur was a very great man, but the success of a discovery depends also upon the time of its appearance. That Pasteur had come at the right moment is proved by the many wonderful discoveries made at about the same time by Koch, Roux and others, but the figure of Pasteur towers gigantic, he who, Prometheus-like, taking knowledge from the past, used it as a "starter" wherewith to lighten modern science.

TROPICAL DISEASES.

Some of the diseases elucidated by Pasteur, such as rabies, anthrax and the streptococcus infections, have a wide geographical distribution, including

tropical or subtropical countries, but Pasteur also took interest in so-called "tropical diseases," such as plague, cholera and yellow fever. We know how one of his fellow-workers, Louis Thuillier, was sent to Egypt in 1883 purposely to study cholera, but fell a victim to the disease. Ten years later Yersin went to China to investigate the aetiology of plague and, independently of Kitasato, discovered the *Bacterium pestis* in 1893. Preparations of Yersin's micro-organism were shown to Pasteur by Roux; they were the last things scientific he looked at, for soon afterwards his great spirit left the frail hemiplegic frame which for nigh thirty years had been going shuffling along between house and laboratory—a broken clay-lamp bearing the vivid flame of knowledge. Pasteur thanked his devoted friend and collaborator and added: "There is still much to do."

In a letter to Dom Pedro de Alcantara, Emperor of Brazil, Pasteur says: "Your Majesty also writes concerning cholera. Neither Drs. Strauss and Roux, nor Dr. Koch have been able to reproduce cholera in animals, therefore great uncertainty reigns with regard to the bacillus to which Koch



Beauprethuy's tomb.

ascribes the cause of the disease. One should be able to endeavour to give cholera to criminals condemned to death, explaining to them that by accepting to ingest bacterial cultures they might make atonement and secure a chance of recovering life and freedom. The disease having manifested itself, one would give them the remedies considered most likely to bring about recovery.

"I attach so much importance to these measures that should Your Majesty share my views, notwithstanding my age and the state of my health, I would go willingly to Rio de Janeiro to devote myself to the study of the prevention of rabies or to the contagiousness of cholera and the remedies to apply to it."

Had Pasteur gone what would have happened? Who can tell? He might have died of yellow fever and the preventive treatment of rabies in man possibly might have been long delayed. He might

have advanced our knowledge of cholera by his bacteriological experiments; but a pupil of his, Dr. Ferran, already in 1885 had produced a vaccine which, applied to man in Spain, had yielded good results. However, one thing is certain: Pasteur at once would have tackled the yellow fever problem and, though he might have failed to discover the true causal organism only recently (1919) demonstrated by Noguchi, it is very probable that he would have proved by consummate experiment the part played by the *Aedes* mosquito in the dissemination of yellow fever. At that very time Dr. Carlos Finlay of Havana was strongly urging the connection between mosquito and yellow fever and endeavouring to prove it by experiment, while thirty years before a French physician, Louis Daniel Beauprethuy, in British Guiana, had already clearly indicated this correlation by incriminating the "house-haunting mosquito as the propagator of the disease." Had Pasteur succeeded, another great Frenchman, Ferdinand de Lesseps, would have completed the great trench he was digging across the Isthmus of Panama.

In 1913, invited by Surgeon-General Gorgas, I had the opportunity of visiting the Panama Canal zone, and there saw the wreckage of the French machinery strewn about as on a battlefield. Later, in British Guiana, I came across the tomb of Beauprethuy. Had this French doctor been heeded disaster would not have ensued. De Lesseps would have triumphed at Panama as he had triumphed on the shores of the Red Sea when (1859-1869), cutting the Isthmus of Suez, he had linked the Mediterranean with the Indian Ocean by a water-way, more direct, more permanent, than the one opened by Seti I (c. 1366 B.C.). Yet the ancient canal, silted up repeatedly by the drifting sands of the desert, and reopened by human beings as countless under Necho, Darius, Ptolemy Philadelphus, Adrian and Amron, was the forerunner of de Lesseps' achievement—a monument far greater than the "splendidly worthless" pyramids!

CLEAN SURGERY.

It has been stated by several writers that Pasteur's discoveries brought about a complete revolution in the treatment of wounds, and that before his time surgeons dared not perform the operations of the present day. This is certainly true if we compare present-day methods with those in general use one or two centuries ago, but not when we consider the great surgeons of antiquity who performed all major operations with wonderful success, thanks to a suitable narcosis and to surgical cleanliness as scrupulous as ours. The danger of contamination from the access of external morbid agencies (atmospheric dust, dirty hands, &c.) was appreciated fully by the ancients and every endeavour made to protect wounds as jealously as they did wine from germs. This is exemplified as clearly in the application of wine and oil by the Good Samaritan as it is in the oil-seal still used in the long neck of the Chianti flask.

During the Middle Ages the majority of surgeons relied chiefly on suppuration for the cleansing and healing of the foul wounds contaminated by their malpractice. In their crazy endeavour to promote suppuration at all costs, they applied even to fresh wounds all kinds of poultices and also tents plastered over with irritants! However, men of



♂ Achilles bandaging the arm of wounded Patroclus, Munich.

common sense were not lacking who denounced the suppurative remedies and promoted healing by first intention. Thus, in the thirteenth century, Hugo Borgognoni of Lucca and his son Theodoric washed wounds with boiled wine, then closely approximated the edges in order that by perfect coaptation the dry adhesive surfaces might unite easily by virtue of Nature's glaucy exudation. On the outer surface they laid lint steeped in wine.

"Wash the wound scrupulously from all foreign matters," says Henry of Mondeville (circa 1315); "use no probes, no tents—except in special circumstances; apply no oily or irritant matters; avoid the formation of pus, which is not a stage of healing, but a complication . . . When your dressings have been carefully made, do not interfere with them for some days; keep the air out, for a wound left in contact with the air suppurates; however, should pain and heat arise, open and wash out again . . . Nature works better alone; if first intention fail she may succeed in the second, as a jeweller, if he can solder gold to gold, does so; if not, he has to take to borax."

These were the very principles taught in Hippocratic days, when the water to wash wounds was filtered and boiled, the dressings made of new linen, the surgeon's hands and nails carefully cleansed, wine and oil used as local applications, access of air avoided, and various antiseptics used in the treatment of infected wounds. That the ancient Greeks were successful is proved by the fact that healing by first intention was expected in all clean-cut flesh wounds, while suppuration was anticipated in confused and long-neglected wounds.

Very suggestive of aseptic methods is the fact that the surgical instruments of the ancient Greeks

and Romans were made entirely of metal, usually of one piece, so that they could be sterilized by boiling. The knives bearing at one end a blade of well-tempered steel, had, at the other, a bronze lanceolate or spatulate blunt dissector. The steel blades were united to the bronze handle by aseptic joints, but in most cases the former have disappeared, leaving a small shapeless mass of oxide at the handle groove. Our present-day instruments closely resemble the ancient Greek tools, differing from those of a century ago, which folded into hollow handles of wood, bone or tortoise-shell, and could not be kept clean.

Among the many ancient surgical instruments that I have had the opportunity of collecting and examining is a very beautiful set, found near Lake Trasimenus, where Hannibal defeated the Romans in the summer of 217 B.C. Among these instruments was a bronze hairpin surmounted by an exquisitely worked female bust, the hair drawn in graceful strands into a knot at the back of the Grecian head. Beneath the spell of these verdigised instruments one visualizes a young army surgeon trampled to death in the wild charge of the Punic cavalry, and in far-away Rome a maiden whose hairpin he had treasured mourning his loss.

Yet all this had been forgotten. Soporifics had gone out of use, cleanliness had given way to filth, and Death stalked grimly behind the surgeon. Picturing the wards of a hospital in his day, John Bell ("Principles of Surgery," 1801-7) tells us of "limbs variously wounded, but all of them lying out, swollen, suppurating, fistulous, rotting in their own filth, having carious bones, bleeding arteries and a profusion of matter; the patients exhausted in the meanwhile with diarrhoea, fever and pain." And ("Discourses on the Nature and Care of Wounds" (1795)) of surgeons "quite delighted with seeing prodigious quantities of matter spouting out when they drew their spigot away."

In a lecture delivered on April 30, 1878, Pasteur said:—

"If I had the honour of being a surgeon, convinced as I am of the dangers caused by the germs of microbes scattered on the surface of every object, particularly in the hospitals, not only would I use absolutely clean instruments, but after cleansing my hands with the greatest care and putting them through a flame (an easy thing to do with a little practice), I would make use only of charpie (unravelling linen), bandages and sponges which had previously been raised to a heat of from 130° to 150° C., and I would employ only water which had been heated from 110° to 120° C."

It is on Pasteur's work that Lister founded his treatment of wounds, as he himself tells us in his



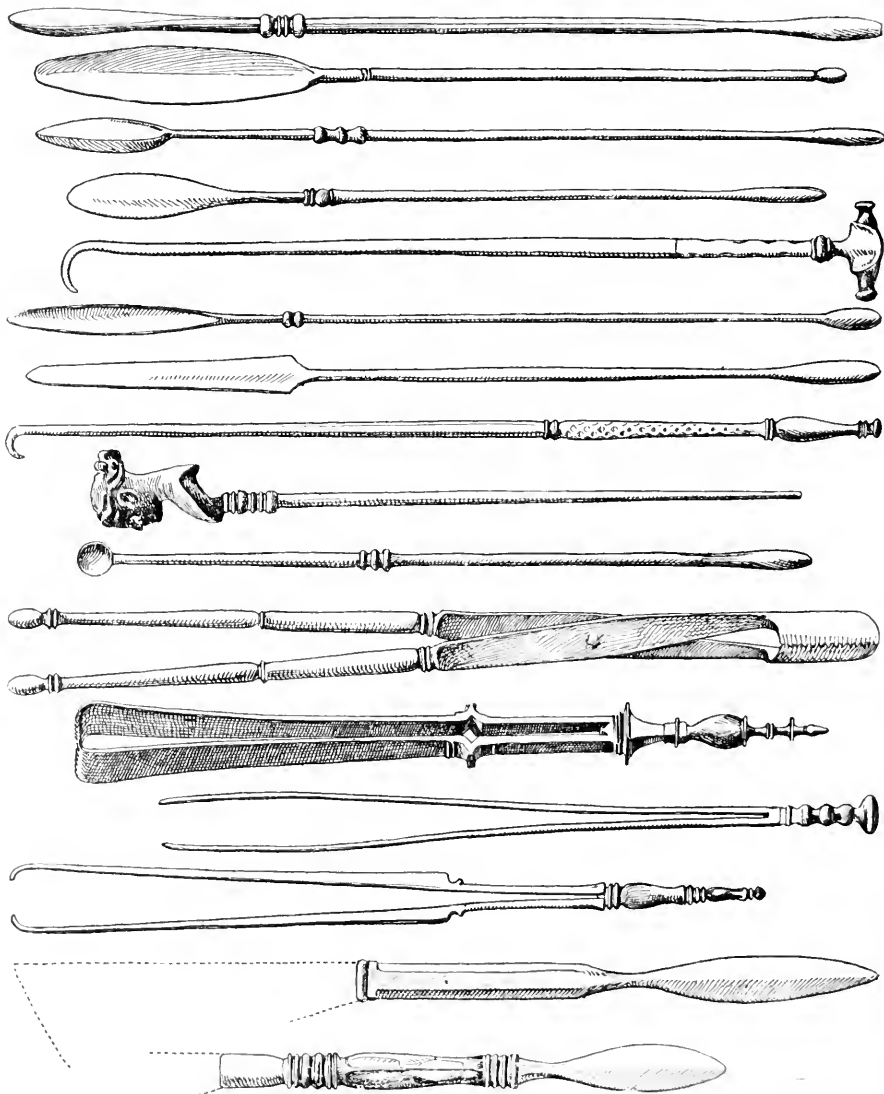
Roman bronze fibula—one of several found with surgical instruments, Lake Trasimenus.

very first communication published in the *Lancet* of March 16, 1867. To-day nothing remains of Lister's methods: the undiluted carbolic with which he used to swab the wounds, his protective

plaster smeared with copal and dextrin, his carbolic putty, his metal shields, his mackintosh covering, his steam spray have gone, only remains the cotton-wool and gauze dressings he borrowed from Guérin, the india-rubber drainage-tubes he adopted from Chassaignac and the safety-pin or fibula of the bronze age; but the part he played in applying

Pasteur's teachings made a landmark in the evolution of modern surgery which never will be forgotten.

Yet, whilst honouring Lister, we should not forget his fierce opponent, Robert Lawson Tait, a great Scotch gynaecologist settled in Birmingham, whose success in operating was truly marvellous



Roman surgical instruments found near Lake Trasimenus, Perugia, Italy.

He performed ovariectomies and other abdominal sections by the thousands with scarce a death. This surgeon scorned Lister's complicated and exaggerated antiseptic; his success, like that of all successful surgeons throughout the ages, was due to cleanliness—simple, perfect cleanliness.

On the battlefield, where wound infection is usually rampant, chemotherapy necessarily must take precedence; here again the ancients anticipated us. Carbolic acid was used in the treatment of wounds long before Lister's time; we find it employed by the French in the Italian war of 1859 and again during the Mexican campaign. Indeed, coal-tar and wood-tar products are among the oldest of antiseptics; they were commended by Mohammed and used by the ancient Egyptians in their embalming processes. In 1865 Déclat wrote "It is today well proven that carbolic acid and its compounds prevent the development of and partially destroy the germs in the air. One can thus easily understand the favourable action of that acid in wounds of all kinds, in burns and even in midwifery practice. The very latest method of treating wounds by aqueous chlorine (Prof. Lorrain-Smith's "eusol" (calcium hypochlorite and boric acid); Dakin and Carrol's neutral sodium hypochlorite solution) is old, probably very old. I need mention but two well-known preparations: Labarraque's disinfecting fluid (a solution of chlorinated soda) and "L'eau de Javelle" (hypochlorite of potash). Javelle's fluid was used in 1793 by the famous French army surgeon, Pierre François Percy, to heal the fearful sphacelating wounds of the army of the Rhine.

The horrors of the painful, unclean, deadly surgery of the eighteenth century hardly can be imagined. John Hunter considered operations as "humiliating examples of the imperfectness of science," and looked upon the operating surgeon as "an armed savage." He says: "No surgeon should approach the victim of his operation without a sacred dread and reluctance." Operations were like executions and people were afraid of them. Some died of fright before the operation. "La douleur," says Dupuytren, "tue comme l'hémorrhagie." Only the few, made of sterner metal, had the hardihood to subject themselves to the ordeal. Such were the veterans of the Napoleonic campaigns, and Ollier relates how these braves, refusing etherization, which they regarded as the refuge of cowards, lay motionless under the knife.

Modern Anæsthesia with her "laughing gas," her somniferous vapours of ether and chloroform and her cocaine crystals, is a daughter of the nineteenth century.

In 1800 the use of nitrous oxide was suggested by Sir Humphry Davy, who wrote: "As nitrous oxide in its extensive operations appears capable of destroying physical pain, it may probably be used with advantage during surgical operations in which no great effusion of blood takes place." But gas was not used as an anæsthetic until 1844, when Horace Wells, a dentist of Hartford, Connecticut, U.S.A., first tried it on himself. Ethyl ether or sweet oil of vitriol, already known in the thirteenth century and long used for the relief of spasmodic asthma,

does not seem to have been employed as an anæsthetic until the middle of the nineteenth century. In 1818, Faraday pointed out that, mixed with common air and inhaled, "it produces effects similar to those occasioned by nitrous oxide." "Ether frolics" among students brought this substance to the attention of Dr. Crawford W. Long of Athens, Georgia, who first used it in 1842 in several operations to deaden pain. But Long took no steps to make his important results known beyond the immediate circle in which he lived, and the credit went to William Morton, a former pupil and partner of Horace Wells, who in 1846, at the suggestion of Dr. Charles Jackson, gave ether to patients operated upon by Drs. John Collins Warren and Hayward in the Massachusetts General Hospital, Boston. Then Jacob Bigelow, writing in the *Boston Medical and Surgical Journal*, November 18, 1846, announced the discovery to the world, while Morton, who had not disclosed the nature of his anæsthetic, tried to patent it under the name of "letheon," and squabbled with Jackson about their respective legal rights.

Chloroform, independently discovered in 1831 by Guthrie, Soubeiran and Liebig, was first employed as an anæsthetic in 1847 by Professor James Young Simpson of Edinburgh, to whom it had been suggested by David Wardie, a Liverpool chemist.

Finally in 1874 Bennet showed that cocaine, an alkaloid derived from the leaves of *Erythroxylon coca*, "the divine plant of the Incas," possessed anæsthetic properties which were applied in 1880 by Compard and Bordenon to ophthalmic surgery, and in 1885 by Faivel to laryngology.

But was Ancient Anæsthesia less notable, she who gathered narcotic plants wherewith to lull all pain and anguish, bringing forgetfulness? Is she too forgotten?

Many of the operations performed in the far-away past could hardly have been possible without narcosis, and we know that the ancients had excellent hypnotics at their disposal, besides other methods for the nullifying of pain. From Homer, Pindar, Theocritus and Lucian to Boccaccio, du Bartas, Brooke and Shakespeare; from Pliny, Dioscorides and Galen to Paul of Ægina, Serapion, Avicenna, Nicolaus of Salerno, Hugo of Lucca, Guy de Chauliac, Gian-Battista Porta, Andrew Borde and William Bulleyn, literature is full of information on the subject.

Local analgesia, by means of pressure, constriction, ice, freezing mixtures and carbon dioxide, was known and practised from the remotest antiquity, appearing and disappearing like a playing dolphin through the stormy waves of time. The Assyrian practice of compressing the carotids to obliterate by insensibility the pain of circumcision was known to the Greeks, who called the carotids "arteries of sleep"; again it was brought into use by the Spanish anatomist, Juan Valverde, about 1560, by Morgagni about 1750. The constriction of limbs before amputation to deaden pain and prevent hæmorrhage takes the shape of Petit's screw tourniquet in the eighteenth century, becomes Esmarch's rubber bandage in our day. Numbness by freezing is forgotten and revived again and again; in the seventeenth century we see Bartholinus applying cracked ice upon the part to be operated; after the battle of Eylau in 1807 we hear Larrey tell Napoleon that in that temperature of — 190 amputations were almost painless; in 1850 we find Arnott and Hunter applying freezing mixtures before using the knife. Carbon dioxide was employed as a local anæsthetic by the ancient Egyptians and Greeks in the form of finely powdered Memphis marble applied to the part and made effervescent by wetting with vinegar. It was the forerunner of the carbon dioxide spray used by Percival in 1772, of Richardson's ether spray in 1886.

To induce general anæsthesia hypnosis was resorted to by the ancient Hindus, Persians and Egyptians. In 1841, Dr. Esdaile uses it successfully in operations on natives in India; later, Dr. Bryan at Leicester in cases of confinement. But the ancients relied chiefly on stupefying herbs, such as mandrake (*Atropa mandragora*), belladonna (*A. belladonna*), now again much used in con-

nection with anaesthesia, henbane (*Hyoscyamus niger*), an alkaloid of which hyoscyne also is now used as an adjuvant to anaesthesia, hemlock (*Conium maculatum*), lettuce (*Lactuca virosa*), white poppy (*Papaver somniferum*), woody nightshade (*Solanum dulcamara*), and Indo-China hemp (*Cannabis indica*).

The mandrake, with its strange manikin-like root, is clearly mentioned by many authors as used to cause insensibility during operations. "It is taken," says Pliny, "before cuttings and puncturings that they may not be felt." Dioscorides tells us that "A wine is prepared from the bark of the root without boiling, and three pounds of it are put into a cadus of sweet wine; of this, three cyathi are given to those who require to be cut or cauterized when, being thrown into a deep sleep, they do not feel any pains." Aulus in his "Liber de Herbis" says: "If anyone is to have a limb mutilated, burnt or sawn, he may drink half an ounce of mandrake with wine, and while he sleeps the limb may be cut off without any pain or sensation." Sir Benjamin Ward Richardson once prepared a draught according to the directions given by Dioscorides and took it. "The phenomena repeated themselves with all faithfulness," says he, "and there can be no doubt that, in the absence of our now more convenient anaesthetics, mandrake might be used still for general anaesthesia with some measure of efficacy." Not only was mandrake taken in wine, but Pliny informs us that for surgical purposes "it is sufficient for some persons to seek sleep from the smell." Indeed, the ancients knew perfectly well that volatile substances act more promptly and effectually when inhaled.

Chinese hemp, the famous hashish used by the Arabs, to dream Paradise or to rob and rape, has long been employed as a narcotic in China, India, Persia, Egypt and Southern Russia. Herodotus tells us that the Scythians were in the habit of inhaling the vapour of hemp seeds thrown upon hot coals, while both in China and India hemp has been used as a surgical anaesthetic from the remotest times. Prosper Alpinus, in his book on Egyptian medicine, describes an ingenious method of using hemp for cauterizing and stupefying at the same time. Miss Bird, the well-known traveller, describing a Chinese hospital in Hong-Kong, says: "The native surgeons do not use chloroform in operations, but they possess drugs which throw their patients into a profound sleep, during which the most severe operations can be performed."

Of opium, belladonna and henbane I need say nothing, as their narcotic properties are well known and appreciated at the present day, but I must recall the excellent mixtures of hypnotic drugs used by some of the great surgeons of the Middle Ages for the purpose of general anaesthesia. The most celebrated of these was the "Spongia somnifera" of Hugo of Lucea. Theodorici his son gives the composition, and states how it is to be used: "Take of opium, of the juice of the unripe mulberry, of hyoscyamus, of the juice of hemlock, of the juice of the leaves of mandragora, of the juice of the wood-ivy, of the juice of the forest mulberry, of the seeds of lettuce, of the seeds of dock, which has large round apples, and of the water-hemlock, each an ounce; mix all these in a brazen vessel and then place in it a new sponge; let the whole boil as long as the sun lasts on the dog days until the sponge consumes it all, and has boiled away in it . . . As oft as there shall be need of it, place this sponge in hot water for an hour, and let be applied to the nostrils of him who is to be operated on until he has fallen asleep, and so let the surgery be performed." To arouse the patient after the operation vinegar or the juice of fenugreek were applied to his nostrils.

Hugo's sleeping sponge was still used in the early part of the sixteenth century, then temporarily abandoned. Pare refers to it as a practice "used formerly by operators"; but in 1589 the Neapolitan physician, Gian-Battista Porta, uses a very similar confection made of hyoscyamus, solanum, poppy and belladonna enclosed in a leaden vessel, and the "lid being open, the patient would draw in by breathing the most subtle strength of the vapour, so that thereby he would sink into a most profound sleep, nor be aware of what had been done to him."

Guillaume du Bartas (1544-1590) in his poem, "La première Semaine," says:—

"Even as a surgeon minding off to cut
Some careless limb; before in use he put
His violent engines in the victim's member
Bringeth his patient in a senseless slumber
And griefless then (guided by use and art)
To save the whole, saws off the infested part."

But how is it that sixty years ago the excellent surgery of the ancients had disappeared almost entirely? Had classic medical literature become a dead letter? Read Galen. Look at this, for instance. Vividly does he describe Antyllus's operation for aneurysm by double ligature and excision of the sac, still the best ever devised, and, mark you, success depends on the most scrupulous asepsis. Galen even tells us where Antyllus got his "Celtic linen thread" and we visualize the sturdy old surgeon walking down the Via Sacra, conversing about song and declamation and then we enter with him the very shop between the Temple of Rome and the Forum! I wonder what he would have said, had we been able to inform him, ancient his aneurysm operation, of the discovery of the circulation of the blood by William Harvey, an English physician of the seventeenth century. He might have replied that Queen Anne was dead.

We now have an historical section at the Royal Society of Medicine, but would not research be better directed in studying the evolution of Medicine, Surgery and Pharmacy in its broader, more fruitful aspects, than in shaping and glazing local idols which, like the blue *ushabtis* of ancient Egypt, may well serve the dead, but are of no earthly use to the living?

THE CONQUEST OF RABIES.

Among the several reasons and circumstances which led Pasteur to take up the investigation of rabies, Bassi's anticipations should not be forgotten (see p. 168). Time was ripe for the elucidation and prevention of this appalling disease. Duboué, of Pau, reasserting a fact established by Democritus twenty-four centuries ago, had shown that the anatomical seat of rabies is in the nervous system, more especially in the spinal bulb. Magendie (1813) had discovered that dogs are attenuators of the rabie virus and can be rendered immune from it. A rabid dog had been made to bite a healthy one; this, when madness had declared, bit a third and so on, the period of incubation becoming longer in each successive passage, until the fourth or fifth dog was able to resist the now attenuated virus. Galtier, of Lyons, by inserting small pieces of the brain and bulb of rabid dogs beneath the skin of rabbits had produced the disease in these animals. He had discovered that the period of incubation is shorter in rabbits and that this timid burrower is an intensifier of the rabie virus. He had used rabbits "as convenient and safe reagents to test the virulence or non-virulence of various fluids taken from rabid animals." Already from early times (Pliny, Avicenna) the



J. T. Nettleship
17 Sept '89

STUDY OF A RABID DOG.

FROM AN OIL PAINTING BY J. T. NETTLESHIP.

This picture was presented to the Museum of University College Hospital by Sir Victor Horsley.

blood, liver and brain of rabid animals had been given to the bitten persons as preventives. The practice was still rife in Finland and Russia, as described by Dr. Ruthmeister and Dr. Stockmann respectively, both of whom had been led to consider the raw blood of a rabid animal as truly protective. In China and other countries, at certain seasons (usually midsummer), dog was eaten, as universally as lamb with us on Easter Day, and the fashion had been instituted primarily to reduce the number of vagrant dogs at the most dangerous season, clearly a preventive measure against rabies.

The treatment of the wound had been always the same. As in the case of snake-bite, an attempt was made to eliminate the virus as promptly and thoroughly as possible, the first instinctive impulse being to suck the wound which may be done by the

leg," says Sir Thomas Watson (1843), "and the bite was of such a kind that the whole wound could not be excised, or thoroughly cauterized, my reason would teach me to desire, and I hope I should have fortitude enough to endure, amputation of the limb above the place of injury."

In the days of rampant phlebotomy, the victim of rabies was bled so fearfully that the bleeding could serve no other purpose than to promote the euthanasia. Mr. Abernethy said that as bleeding had been much extolled, had he hydrophobia, he would allow a surgeon to bleed him even to death.

How hopeless the blind groping after remedies and what poison has not been given by the physician to his rabid patient, from belladonna, stramonium and white hellebore to prussic acid and the American arrow-poison curari, first brought to Europe by Sir Walter Raleigh in 1595? Indeed, we find him inflicting the bites of live vipers and rattlesnakes; and why? Because no less a man than Trousseau, quoting a greater ancient, had said: "In the presence of a malady which constantly terminates in death, the practitioner's duty consists in boldly trying everything!"

A cruel custom, which long prevailed, was the throwing of the patient unexpectedly into water. "The patient," says Dr. James (1745), "is to be thrown headlong into the sea, or some river, with a great deal of apparatus, threatening words and other circumstances capable of striking terror into him, for which purpose he is to be frequently immersed in the water and again taken up. And this method is to be often repeated with the same train of circumstances; for the good effects are only produced by the dread and consternation into which his mind is thrown and not the water." And lastly, under pretence of shortening his sufferings, but really for fear of being bitten, the unhappy patient was smothered between two feather-beds by his terrified attendants.

Thoroughly to appreciate the value of Pasteur's work on rabies, one must have seen the rabid dog charge into a joyful group of playing children, snapping savagely right and left; one must have witnessed the agonies of these same children dying of hydrophobia!

In dog and man alike the disease exhibits three successive stages: a preliminary, one of excitation or madness, and a paralytic stage. The first, as a rule, begins from three to eight weeks after the infective bite, but it may be delayed three, six, or eighteen months; indeed, longer incubation periods of three, five, seven and more years have been recorded. Some years ago, whilst I was in Italy, His Majesty King Victor Emmanuel informed me of a case in one of his foresters in which, to all appearances, the virus, introduced by the bite of a rabid dog, had lain dormant for seven years. Cases of seven years latency should be regarded with great scepticism, yet they have been mentioned by Dioscorides in the first century and several times since. Thus, in the first volume of the *Lancet*, Mr. Hale Thompson records the case



Cave Canem, Pompeii.

bitten person, who should carefully spit out the poison afterwards. Dr. Berkenhout, in his pamphlet on rabies (1783), relates the heroism of his own daughter who, by sucking the wound, had saved her little brother, bitten on the thigh by a mad dog. As a rule, the wound is washed out thoroughly and allowed to bleed, or it may even be cupped. Then it is mopped dry and cauterized deeply with a red-hot iron or with some fluid caustic, such as fuming nitric acid. The keys of churches often have been used, with prayers and blessings, for cauterizing the wounds inflicted by rabid wolves or dogs. Those of St. Hubert, patron of hunters, in the Ardennes, Belgium, long have been famous. In the days of the musket, cauterization was effected by filling the wound-cavity with gunpowder and firing it. Cauterization was followed by suppuration, long sustained by means of powdered cantharides or other irritant. Some physicians had commended the early and complete excision of the bitten part, or even amputation. "If I had received a bite from a decidedly rabid animal upon my arm or

of a lad who died of hydrophobia seven years after being bitten on the right hip, which still showed the scar. For over two years before death this patient had been in prison, closely confined and out of the reach of dogs altogether.

With the development of the disease the dog's disposition changes. He becomes depressed, dull, uneasy, his attitude indicating suspicion and fear; he creeps away into dark corners or under beds. Then, agitated and restless, he moves from place to place, lies down and gets up; when about to lie down, he turns round and round far more than the bed-making instinct requires; indeed, he demolishes his bed and changes posture again and again. He sniffs about anxiously, scratches with his fore-paws, tears curtains and carpets, gnaws wood and leather as avidly as a puppy, swallows inedible things such as hair, straw, rags and stones; he may champ his chain with bleeding mouth.

He answers his master's call but comes reluctantly, fawning, whimpering, as though afraid, yet ready to be caressed. He looks fondly up in his master's face but the eyes have a strange look; they are no longer the soft, brown, clear, living gems, glowing with the steady flame of faithfulness; now they are glassy, sombre, despairing. They seem to say: "You can do nothing." Later, when called, he will look up with a start, only to whine and slink away. He winces at the slightest sound.

Suddenly he is off at a slouching lope, tail down, head and ears drooping. He wanders erratically far from home, running, stumbling, stopping with neck outstretched, growling, snapping at the air, or springing as if to seize a prey, eyes red and glaring. His bark is furious but unnatural, reverting to the dismal call of the wolf; it is a jumble of bark, howl, growl and snarl, reminding one of the yapping of a greyhound hounded at the hare, or of a strange cock-crow, a hollow, hoarse bark, followed by four or five diminishing howls—a sinister, lugubrious sound, once heard never forgotten.

Agitation increasing, exasperated, once more possessed by the pristine ferocity of the carnivora, the impulse to bite is irresistible and he will fly savagely at any animal or man in his path. Thus, often travelling many miles, he may leave a trail of death behind him. He appears to be harassed by phantoms; movements and attitudes both suggest hallucinations of sight and hearing. It is at this stage, in spite of himself, that he is likely to bite his master. His bloodshot eyes with wide pupils, squinting and glinting, have a baleful expression, but they are full of tears. The face and forehead are wrinkled, a frothy, viscid saliva hangs in strings from his curled-up lip; he is gulping constantly as if trying to swallow something; his laboured breathing is marked by strange choking sounds. Between paroxysms of insane rage he falls exhausted.

In cases of so-called "dumb madness" there is no barking; the lower jaw drops paralysed, with lolling lead-coloured tongue a gargoyle for the dribbling saliva. The animal crouches with eyes staring and fixed.

After only a few days, fearfully wasted, back arched, fur bristling, covered with dirt, the rabid dog moves stiffly, swaying, staggering and falling, finally to move no more.

Very similar is the picture presented by the human sufferer. The same restlessness, the same apprehensiveness, the same excruciating excitability, the same hallucinations, the same collapse. As in the dog, so in man, the symptom-complex indicates clearly the essential bulbar character of the malady.

The patient has a scared, anguished look, the face is pale, eyes red and wild; the whole frame is in a state of intense nervous irritability. He dreads the touch of his own hands; the scent of flowers distresses, the least noise startles, even a draught of air from door or fan is likely to start excruciating spasms. All the sensations are exaggerated to the point of pain, but the most characteristic feature is the terrible spasm of the fauces which has given the name of hydrophobia to the disease. The muscles of the neck are stiff and painful, the throat congested, the voice husky, and swallowing is not only difficult and painful, but attended invariably with an agonizing feeling of suffocation. Parched with thirst, at first the patient drinks with obvious distress, later the difficulty of swallowing becomes more marked. If offered water, he will draw back his head with a shudder; the sight, the sound, the very name of water, a mere flash from a glass mirror, because they suggest swallowing, are likely to produce those painful reflex spasms of the larynx and throat which, accompanied by choking, lividity and sobbing are so distressing to behold. The patient dare not even swallow his saliva, and viscid, frothy liquid accumulates in his mouth. The breathing is irregular and shallow; it consists of a succession of sighs. From time to time a look of terror passes across the patient's features; he is tormented by hallucinations and speaks to persons who are not there. Occasionally furious maniacal excitement accompanies the convulsive paroxysm and the sufferer, with livid face and staring blood-shot eyes, frothing at the mouth, grins, curses, gnashes his teeth, blows and spits about the viscid mucus and saliva that well up in his mouth; he even bites his own hands. In the intervals usually the mind is clear; he is solicitous for those about him. The end may occur from asphyxia during a paroxysm, or the exhausted and now parietic patient may sink gradually into unconsciousness and death. It is a miserable death, made still more terrible by man's ignorance, superstition and cowardice.

Trousseau mentions a case he saw when he was a student. Esquirol ordered the patient to be put into a cell and the poor fellow apologized for the trouble he gave. By Esquirol's order he was tied to his bed without his offering any resistance, then he was ordered to be bled. "I held his arm," says Trousseau, "and as he kept spitting all the time, my face was covered with his saliva. On a napkin being thrown over his head, he took fright

and became seized with convulsions; the blood ceased to flow and he died."

Sir Thomas Watson describes a case he saw in Middlesex Hospital (October, 1837). A strait-jacket had been put upon the patient, who begged that no unnecessary violence might be used and asked to be poisoned. Then he spat at some of the bystanders and reproached them. . . . He sneered at the students and said they showed bravery enough now he was confined; was it right for young gentlemen of education to stand there gazing with curiosity on a dying man?

The hoarse, raucous voice of the rabid patient, the strange unnatural sounds he emits during paroxysms, owing to accumulation of mucus in his mouth and throat, have been likened to the barking and growling of a dog; his attacks of fury and despair, his very prostration when exhausted, have given rise to strange tales of men changing into dogs or wolves. As late as 1840, persons suspected of having rabies were shot by their neighbours on the Austrian frontier.

Yet, Hindu poetry had created the hero Yudhishthira (ideal of excellence), who refused to enter Heaven at all unless his dog might accompany him.

Having verified by numerous experiments the results obtained by Magendie and Galtier, Pasteur conceived the idea of utilizing the intensified rabbit virus to overtake and destroy the slower acting dog virus. A man bitten by a rabid street dog does not develop the disease before three to eight weeks. Therefore, thought Pasteur, there might be time to immunize the patient by inoculation of the far more rapid and potent rabbit virus before the first symptoms of the fatal canine infection broke out. Thus a race for the life of man was started between the swifter rabbit virus, handicapped by a later start, and the slower dog virus already in its stride along the nerve course. Success depended on the speed and potency of the laboratory virus employed against the street-dog virus, and Pasteur and his fellow-workers exalted dog virus by many successive passages through rabbits until they obtained a virus which produced the death of the last inoculated animal in seven days. Beyond this point no increase of virulence being possible, Pasteur called the seven-day virus "fixed-virus."

Already a like race had been run between inoculated cowpox and naturally acquired smallpox. "Vaccination passes more rapidly through its various stages than does natural smallpox," says Murphy, "and can therefore overtake the latter," and Marson says: "Supposing an unvaccinated person to inhale the germ of variola on a Monday, if he be vaccinated as late as the following Wednesday, the vaccination will be in time to prevent smallpox being developed; if it be put off until Thursday, the smallpox will appear, but will be modified; if the vaccination be delayed until Friday it will be of no use; it will not have had time to reach the stage of areola, the index of safety, before the illness of smallpox begins."

The fixed virus (about 2 c.c. of a salt solution

emulsion) was injected beneath the dura mater of a healthy rabbit after trephining a small area in the forehead. Just before death, when completely paralysed by rabies, the animal was killed with chloroform and the cord removed under aseptic precautions, then suspended by sterilized silk thread in a cotton-plugged bottle, the contained air of which was kept dry by rods of caustic potash. The drying and keeping of the cord by Pasteur, like the drying and keeping of the smallpox scabs by the ancient Chinese, brought about a progressive attenuation and finally (at the end of about a fortnight) a complete loss of virulence. After about eight days a sufficient attenuation was obtained to start inoculation in the man that is doomed to death by the bite of a rabid dog. The desiccated cord was triturated in salt solution and the emulsion injected subcutaneously. Injections were made every day, sometimes more frequently, during a period of fifteen to twenty days with progressively more virulent emulsions.

The first human being to undergo Pasteur's treatment was Joseph Meister, an Alsatian boy nine years old, brought to Paris on July 6, 1885. He had been thrown down by a rabid dog and had received many bites on the hands, legs and thighs, some of them so serious that he could scarcely walk. The principal wounds had been cauterized with carbolic acid twelve hours after the accident. He returned to Alsace on July 27 thoroughly immunized. On October 26 Pasteur considered himself justified in communicating the result of his experiment to the Académie des Sciences. RABIES HAD BEEN VANQUISHED.

In reviewing Pasteur's glorious achievements one should not only remember the work of his predecessors, but also that of his great collaborators, Raulin, Ducleaux, Chamberland, Joubert, Gernez, Van Tieghem, Thuillier and, above all, of Roux, who, together with Yersin, in 1880, laid the foundations of the serum treatment of diphtheria. Thus of the innumerable threads which form the warp and weft of the rich brocade which Science is ever weaving, Pasteur's work stands out in purest gold.

Annotations.

Psoriasis: A Few Notes concerning its Occurrence in South Africa (Cornelis Pijper, M.D., *South African Medical Journal*, March, 1921).—In those parts of South Africa where the altitude is less than 4,000 ft., psoriasis seems to be very irregularly distributed; it appears to be rare in the parts where the altitude is more than 4,000 ft. Cases where the initial attack occurred at a very early and at a rather advanced age (over 40, or even 50) have only been reported from places under 3,000 ft. A rather high percentage of cases are complicated by asthma; this calls for closer investigation.

There is a *consensus opinionis* in South Africa

that psoriasis is decidedly rare amongst the non-European sections of the population. Very little indeed is known about this disease. Given the fact that, although, as a rule, psoriasis does not shorten the span of life, and but seldom gives rise to serious inconvenience, yet it manages to embitter life, and, as the total number of patients in the Union must be considerable, the total amount of misery created by it is very great, and although temporary remedial measures are possible no permanent cure has yet been discovered.

Investigations on the Etiology of Diseases in the Herpes Group (Lipschutz, *Derm. Wochens.*, January, 1922).—Experiments were made to inoculate the cornea of rabbits with virus taken from herpes vesicles (herpes zoster, genitalis and febrilis). It was found that the most active was that obtained from herpes febrilis (100 per cent. positive inoculations), the least active being herpes zoster, which hardly reproduced any lesions at all. Cell inclusions of definite morphological and stainable character occurred in all three types, both in animal and human cases; the author is of the opinion that these are nuclear reactions to the specific virus of the herpes group. It is suggested that the cell nucleus as virus carrier may be responsible for the difficulty in elucidating the etiology of other dermatoses, such as condyloma acuminatum and warts.

Naga Sore (E. C. R. Fox, *Indian Journal of Medical Research*, vol. viii, No. 4, April, 1921).—Naga sore or eachar hole has long been known to be endemic in Assam, and in some years assumes the character of an epidemic. Clinically, the ulcer conforms in practically every respect to tropical ulcer or tropical phagedena, as described by Castellani and Chalmers. The naga sores are always circular or oval, usually situated below the knee, deeply cupped, and occasionally having undermined edges. The surface is covered with a thick, tenacious, dirty-grey secretion, simulating a false membrane. On removing this a red granulating surface is seen. These ulcers are extremely painful.

Elephantiasis (W. H. Strother, *Kentucky Medical Journal*, April, 1921).—The author describes a case of elephantiasis in a negro, aged 45, who had never been outside Kentucky. Twenty-five years previous to admission to hospital the patient had suffered from syphilis. In June, 1917, he had an attack of fever and chills, which left him very weak. In February, 1918, his feet began to swell, and, on the bursting of the skin, a lot of serous fluid was discharged, after which he was unable to lie down in bed. There was considerable ulceration and very foul odour. The case appeared to be one of elephantiasis of both lower extremities up to the knee. Both legs were amputated above the knee, and the patient died from shock, due to hæmorrhage, on the ninth day.

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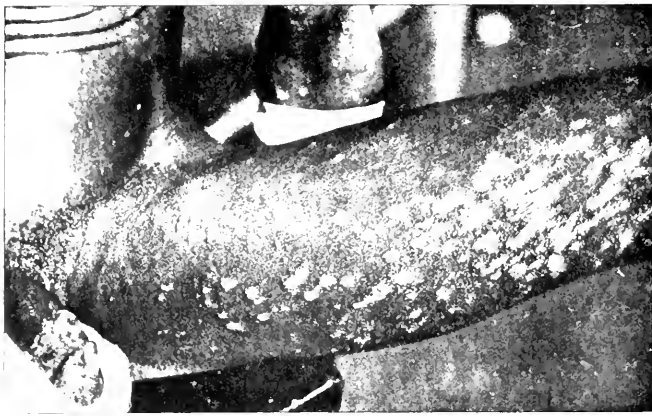


FIG. 1. Illustrates the type of the eruption on the thigh and penis and upper part of left forearm. The planus form is well seen on the forearm and the linear form on the thigh.



FIG. 2. Illustrates the linear form and the sclerosus form.



FIG. 3. Illustrates the sclerosus form.

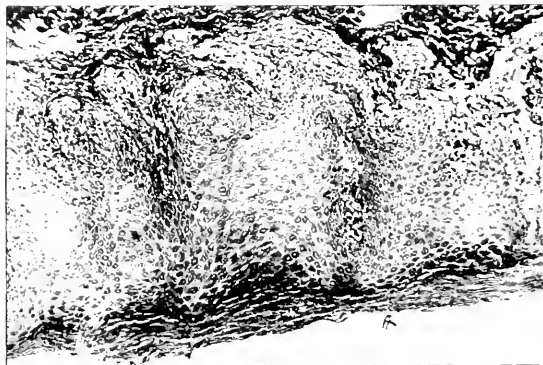


FIG. 4. Section of young papule showing hyperkeratosis and acanthosis with increase in the stratum granulosum layer, and cell infiltration of the corium and papilla. (x. 130.)

Original Communications.

LICHEN PLANUS HYPERTROPHICUS IN THE SUDAN.

By R. G. ARCHIBALD, D.S.O., M.D.

Director, Wellcome Tropical Research Laboratories, Khartoum.

THE case which forms the subject of this paper was a native of Dongola serving in one of the Sudanese battalions stationed in Khartoum. He was aged about 28, of good physique and intelligence, and according to his history had always enjoyed good health, and had never suffered from venereal disease; he had recently returned from a patrol in the South-west districts of the Sudan where he had undergone the stress and strain usually associated with military operations. According to his statement his attention was attracted three months ago to an eruption on the inner side of the left thigh which caused him no inconvenience other than a considerable degree of itching.

The eruption apparently commenced in the form of small papules which extended to the dorsum of the left foot and to the extensor aspect of the thigh; then appeared on the right thigh, and on the dorsum of the right foot; then on the flexor aspect of the forearms, palms of the hands and on the glans penis.

CHARACTERS OF THE ERUPTION.

The eruption was essentially a papular one consisting of small as well as large papules distributed over the flexor aspect of the forearms, the extensor and inner aspect of both thighs and legs and over the dorsum of the feet; the palms of the hands and the plantar aspects of the feet were also affected as also the glans penis and the scrotum. The eruption was more marked on the flexor than on the extensor aspects, and did not appear to follow the distribution of any particular nerve trunk; a few papules were noted on the skin of the abdomen and chest. The skin of the head, face and dorsum of the trunk appeared to be the only unaffected areas of the body. No papules were present either on the buccal mucosa or on the dorsum of the tongue.

It was apparent to the unaided eye that two types of papules constituted the eruption: (a) Small discrete papules measuring from 1.3 mm. in diameter; (b) larger papules of various sizes of firm consistency extending to 0.5 cm. in diameter.

The small discrete papules when examined with a lens were of a pinkish red to a bluish or purplish colour with a well marked polygonal base and a flat somewhat shining surface when viewed in a slanting light. No depression or umbilication of the surface was noted.

In some areas of the skin the papules had lost their discrete appearance, and had coalesced presenting a triated surface covered with fine silvery epidermal scales which could only be removed with difficulty (fig. 1). Some of these scales were scraped off and

treated with 20 per cent. caustic potash but no evidence of fungal elements were noted.

On the inner side of the left thigh and on the dorsum of the foot (figs. 1 and 2) the papules had taken on a somewhat linear arrangement obviously as the result of scratching; the papules in this area showing well marked scaling.

On the glans penis and scrotum (fig. 1) the papules were less elevated than on the other parts of the body, and were whiter in colour.

The larger papules were situated chiefly on the flexor aspect of the wrists and on the dorsal surface of the feet (fig. 3); in the latter situation they were very prominent more especially in the proximity of the ankles where many of them had become confluent, standing out as somewhat thickened indurated plaques about 0.5 cm. in diameter, of a dark colour, with a surface covered with very adherent scales forming the so-called lichen sclerosis.

Scales from these large plaques were removed and also examined for evidence of fungal elements with negative results.

HISTOPATHOLOGY.

A small papule on the flexor aspect of the forearm was excised, fixed in picric alcohol, sectioned and stained by different methods. In the epidermis there was a definite hyperkeratosis, some thickening of the stratum granulosum, and an acanthosis (fig. 4).

The cells of the rete showed evidence of colloidal degeneration and a certain degree of intercellular oedema was noted.

In the upper part of the corium and in the papillae there was a cellular infiltration consisting of round cells, connective tissue cells and a few plasma cells; the vessels of the papillae were also dilated.

REMARKS.

There can be no doubt that the case represented a severe lichen planus in which the hypertrophic element was well marked. The flat-topped papules with their angular outline, purple colour, and shining appearance, their tendency to patch formation with an adherent silvery scaly surface with outlying typical papules, their itchy character, their distribution and histopathology, were features characteristic of this disease, and sufficient to diagnose it from either pityriasis rubra pilaris, or a papular syphiloderma or psoriasis.

Lichen like eruptions are not commonly seen in the Sudan; lichen scrofulosorum has been described, but as far as the writer is aware lichen planus hypertrophicus has not been previously noted. The interesting feature of the case was the extensive distribution in a short period of an eruption in which the planus, linearis, and sclerosis forms were all present.

Thanks are due to Captain N. Cantlie, M.C., R.A.M.C., attached Egyptian Army, for kindly sending the case for examination.

ERYTHRODERMIA CONGENITALE ICHTHYOSIFORME IN AN ARAB CHILD.

By R. G. ARCHIBALD, D.S.O., M.D.

Director, Wellcome Tropical Research Laboratories, Khartoum.

THE case which forms the subject of this paper was that of an Arab girl, aged 3, who, from the time of her birth, had suffered from this somewhat rare skin disease.

According to the history obtained from the parents, the peculiar condition of the child's skin was observed at birth but at that time excited little attention; it was however due to an exacerbation of the malady associated with a certain degree of pruritus during the recent cold months that medical advice was sought. The parents appeared to be healthy types of Arabs who had settled for some years in the Sudan. No history of syphilis could be obtained from either of them; the mother admitted to having had a stillborn child at the fifth month of her first pregnancy, and another stillborn child at the seventh month of her second pregnancy; her third child, the case under consideration, was a full-term child.

CLINICAL NOTES OF THE CASE.

On examination, the child appeared to be fairly well nourished, and apart from the skin condition, was in apparently good health. No signs of organic disease could be detected. Examination of the skin showed the presence of a general scalliness, varying in intensity in different areas of the body from a furfuraceous scalliness to thick plate-like scales. Associated with this scalliness there was also an erythrodermia. The palms of the hands, the anterior aspect of the neck, and the inner side of both thighs represented the only areas of the skin which were unaffected, while the skin over the flexures of the elbows and popliteal spaces was only slightly involved to the extent of a branny desquamation associated with a lichenoid eruption. The scaly condition of the skin was most marked on the antero-lateral aspects of the legs (figs. 1 and 2). In these areas the scales appeared as thick polygonal plates separated by shallow fissures; the skin between the plates was somewhat loose and puckered. The scaly plates, when viewed with a lens, were of a greyish brown colour, and appeared to be more firmly adherent in their central portion than at their edges. Here, as in other parts of the body, there was an erythrodermia noted. The skin on the dorsum of the feet and between the toes was also scaly, while the soles of the feet showed a hyperkeratosis. The toe nails were brittle and fissured. The skin covering the dorsum of the hands and wrists was markedly affected (fig. 3), presenting a loose, shiny, and puckered appearance as if covered with oil paper. The palms of the hands, when viewed with a lens, showed evidence of a hyperidrosis and an erythrodermia without scalliness. The finger nails were unaffected. The flexor aspects of the wrists and forearms showed a condition similar to the dorsum, but in a lesser degree. On the extensor and lateral aspect of the forearms the eruption, when viewed with a lens,

was certainly lichenoid in type, resembling somewhat lichen planus. The inner aspects of the arms and the axillæ were only slightly affected. The face presented a shiny reddened varnished appearance well shown in fig. 4; the scalliness being most marked on the forehead. The skin of the lower part of the face showed a branny desquamation; this was also present in varying degrees on the chest and anterior aspect of the abdomen. The mouth shows no puckering, and there was no evidence of ectropion. The scalp was very seborrhæic, but the growth of the hair was not affected. The skin over the ears and dorsum of the neck and trunk showed a well marked scalliness (fig. 5); this was present to a less extent over the skin of the buttocks and thighs. A general anidrosis was noted, except on the palms of the hands, where, as already mentioned, a hyperidrosis was present.

Several epidermal scales removed from different areas were treated with caustic potash: microscopic examination, however, showed no evidence of a fungal infection. Unfortunately, it was not possible to obtain a portion of the dermis for histological examination.

Examination of the blood showed no parasites but a very definite eosinophilia. A differential leucocyte count gave the following percentages: Polymorphonuclear leucocytes, 45 per cent.; small lymphocytes, 24 per cent.; large mononuclears, 14 per cent.; eosinophiles, 17 per cent.; hæmoglobin, 75 per cent. In view of the eosinophilia noted, a careful search of the faeces was made for evidence of a worm infection but neither ova nor adult helminths were found. The urine showed no abnormalities.

REMARKS.

If the salient clinical points in this case be considered, they will be recognized as representing the dermatological picture of erythrodermia congenitale ichthyosiforme, a somewhat rare malady concerning which there is but scanty literature. As far as the writer is aware, a case has not been previously recorded as occurring in the Tropics. Ichthyosis, it is true, has been previously recorded; indeed, its first description by Avicenna [1] emanated from the Tropics, but the generally accepted view—according to a recent standard work on skin diseases—indicates that erythrodermia congenitale ichthyosiforme is an independent affection quite distinct from ichthyosis.

The main points substantiating the diagnosis may be considered. The history of the case showed that the affection was a congenital one, which had not materially impaired the health of the patient, and had given rise to no subjective symptoms other than pruritus. The history further disclosed that the course of the malady showed periods of remission during the hot months, with exacerbations during the colder months of the year. The ichthyotic condition of the skin, although more or less general, varied in intensity in different areas of the body affecting also the flexures, and was associated with an erythrodermia, which also varied in intensity, occurring most markedly on the forehead and upper and lower limbs; the shiny varnished appearance of the face aided further the diagnosis. On the antero-lateral aspect of

the arms the eruption was lichenoid; the scalp was seborrhæic, and the sweat secretion of the general surface was in abeyance, excepting on the palms where a hyperidrosis was noted. Such were the clinical facts supporting the diagnosis. It was necessary of course to differentiate the disease from ichthyosis congenita, also a somewhat rare malady responsible for the condition known as "harlequin ætus." The presence of ichthyosis with erythrodermia involving the flexures, the lichenoid eruption on certain areas, and the absence of ectropion and fissuring of the mouth, presented sufficient clinical distinctions to rule out ichthyosis congenita—a disease usually associated with a premature birth and rare survival of the patient beyond a few days or weeks.

The case, in view of its rarity, appears to be worthy of record; as far as the writer is aware, the malady has not been previously observed in the Sudan. Some years ago, Chalmers [2] recorded a case of ichthyosis in the Sudan; this case was also seen by the writer, and on clinical grounds alone was quite a separate entity.

As already mentioned, the literature dealing with erythrodermia congenitale ichthyosiforme is somewhat scanty and the writer has been unable to get access to the original articles; most of these, however, are reviewed in that excellent treatise on skin diseases by Stelwagon [3] and Gaskill, which also gives a good account of the malady.

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ANTHOMA TROPICUM (JUXTA-ARTICULAR NODULES).

By RALPH W. MENDELSON, M.D., D.P.H.

Principal Civil Medical Officer, Royal Siamese Government, Bangkok, Siam.

IN suggesting a new name for the affection known as "juxta-articular nodules," the author does so with the idea of inviting constructive criticism on this interesting but seemingly harmless disease. Also, as the result of a careful study of a great number of cases, it seems to us that the disease might be classified as a variety of xanthoma, and because it is limited, in so far as we know, primarily to the tropics and sub-tropics, the term "xanthoma tropicum" is suggested to replace the descriptive term "juxta-articular nodules."

It may be of some interest to relate the history of the disease, and the following is a short résumé of the same. In 1897-98 McGregor first described these nodules as occurring in natives of New Guinea, and at that time suggested a parasitic origin for them. In 1909-1900 Jeanselme observed the same disease in the natives of Siam, and reported them to the Congrès

Colonial de Paris in 1904. He also published two case histories from the Ivory Coast, Africa, in 1910. In 1904 Steiner described them as occurring in the natives of Java as hard, round, irregular, movable, subcutaneous tumours not connected with the underlying fascia, not containing any bacteria on staining, consisting of hard fibrous layers degenerated in the centres into coarse, irregular structureless masses. In 1906 Jeanselme again reported them from Siam. His microscopic findings showed a central layer of degenerated tissue; an intermediate or transitional layer; and an outer layer of inflammatory reaction.

In 1907 Gros observed similar tumours in 10 out of 12,000 patients among Algerian natives, and Neveux in the same year reported the disease among the Songambians. Also in the year 1908 he observed these nodules in the natives of Boundou, who called the disease "matinde."

In 1908 Fontoyont and Carougeau studied the affection in Madagascar. They reported finding a mould which they named "discomyces carougeani," but which proved to be nonpathogenic for monkeys, rabbits and guinea-pigs. Leboeuf observed four cases in New Caledonia in the year 1911, and reported the same.

In the year 1913 Joyeux reported these growths from French Guinea as nodules, consisting of fibrous tissue contained within inflammatory foci, mostly around the blood-vessels. No bacteria were found in sections examined.

In 1915 Breil frequently observed these nodules throughout the coastal regions of British Guinea; in the eastern end of the district from 7 to 10 per cent. of the entire village population was affected. Breil states that Dr. Giblin, of Samarai, reported treating two cases in Europeans.

In 1921 this disease was reported by F. de Quervain, by A. Cange and R. Angaud, and also by P. Noel.

As to the ætiology of the disease, various causes have been mentioned. Some consider it a bacterial affection, others a complication of syphilis, still others think it a late manifestation of yaws. We have made cultures from a great number of these cases with negative results. Animal inoculations with nodule material have always been negative, guinea-pigs, monkeys and rabbits being used. As to the syphilitic origin of these tumour growths our sero reactions did not confirm this. Although in some cases the reaction was positive, in these cases we considered the infection as not the ætiological factor, as in many other cases the reaction as well as the clinical symptoms was quite negative. Yaws we do not consider as the causative factor, we have never been able to demonstrate the organism in sections or nodule juice, nor have we as yet observed any cases exhibiting signs of yaws. Animal inoculations with regard to monkeys being negative, would tend to rule out yaws.

In the author's opinion the cause is some pathological metabolic process as yet undetermined.

In our experience males are much more subject to the affection than females, and we have observed no cases in pre-adult life. Case histories are not suggestive, the great majority of patients exhibiting

normal health, and in the few cases in which signs or symptoms of illness were present the illness complained of could in no way be associated with the presence of the tumours.

These tumours vary greatly in size. We have seen them as small as a filbert and as large as illustrated. Seldom do the patients complain of any pain or inconvenience. We have never observed these growths above the elbows, but below that point they have been seen near every articulation. They are not limited to the articulations, as the illustrations will show. The interior and lateral aspects of the lower legs are favourite sites.

In texture they are hard and usually very smooth. They are often adherent to the surrounding tissues, especially in the old cases. In some cases, especially where the growths are situated so that they are exposed to irritation, we find the tumours infected and often presenting an ulcerated appearance.

Macroscopically they present on cross section the appearance of a simple fibroma. No distinctive capsule has been noticed, and only in old standing cases do we find a necrotic centre.

Microscopically, sections from young tumours may be diagnosed as simple fibroma. There is an abundant blood supply and sometimes a considerable amount of small round-celled infiltration within the immediate vicinity of the blood-vessels. In older cases degeneration sets in, of a fatty nature at first, and in still older cases there is some calcification and amyloid degeneration. We have never noticed a tendency to malignancy either in the protected or greatly exposed masses. In many cases a secondary infection with the ordinary pus-forming organisms produces an abscess. In our sections we have noticed no cells that resemble the granular cells in a syphilitic gumma.

In summing up we would say that as to the aetiology of the disease nothing positive is known, but that it is probably of an auto-aetiological nature is yet undetermined. That the growths are of a benign nature with no tendency to malignancy, and as to treatment we have found no medicinal agent of any value whatever, excision alone produces permanent results where this is necessary.

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DERMAL LEISHMANOID.

By U. N. BRAHMACHARI, M.A., M.D., Ph.D.

Teacher of Medicine at the Campbell Medical School, Calcutta

UNDER the above name, I described in the *Indian Medical Gazette*, April, 1922, a new form of cutaneous leishmaniasis which very rarely develops in cases of kala-azar after antimonial treatment. The disease was subsequently named after me by Lieutenant Colonel Megaw—"Brahmachari's dermal leishmaniasis."

I give here the details of the history of one such case as described by me in the *Indian Medical Gazette*.

Patient, aged 31, an inhabitant of Barisal (Bengal) gave a history of fever coming on with rigors from February, 1917, which was not benefited by quinine. In May, 1917, he had an attack of pneumonia. His fever persisted and there was progressive enlargement of the spleen. He was again treated with quinine which was given intramuscularly in doses of 10 gr. for six days. He states that after this he was free from fever till the end of June, 1917. In July, he again had an attack of intermittent fever, the temperature ranging between 99° F. to 105° F. He was again given intramuscular injections of quinine, but with no benefit.

In January, 1918, he came to Calcutta and was seen by Dr. S. N. Ghose, bacteriologist, Presidency General Hospital, Calcutta, and myself. When we examined him for the first time, his spleen was found enlarged, extending 6 in. below the costal margin and the liver extending 3 in. below the costal arch. The fever was of an intermittent type. He was at first given a course of treatment with soamin. The results of blood examination before treatment with soamin were: Red blood corpuscles 3,000,000, white blood corpuscles 3,500, Hb. 30 per cent., and differential count showed polymorphonuclears 60 per cent., lymphocytes 24 per cent., large mononuclears 1'8 per cent., and eosinophiles 1'2 per cent. The treatment with soamin was not followed by any improvement. Spleen puncture was made and the smear showed the presence of Leishman-Donovan bodies. A few Leishman-Donovan bodies were also found in the peripheral blood. The patient was now treated with intravenous injection of tartar emetic given twice a week in doses of $\frac{1}{2}$ to 10 c.c. He had altogether thirty injections. The fever stopped after ten injections. When he left the treatment, there was marked improvement in his general condition the spleen and the liver could not be felt below the costal margin and the blood condition was: Red blood corpuscles 4,000,000, white blood corpuscles 7,500, Hb. 70 per cent. No parasites could be found



FIG. 1.—Ichthyotic areas associated with erythrodermia on the antero-lateral aspects of the legs.



FIG. 2.—Antero-lateral aspect of left leg



FIG. 3.—Dorsum of the right hand. Note the appearance of the skin as if covered with oil paper.



FIG. 4. Face showing ichthyosis with erythrodermia. Note the shiny varnished appearance of the skin.

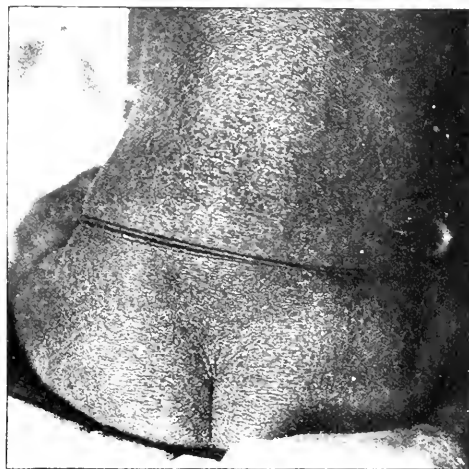
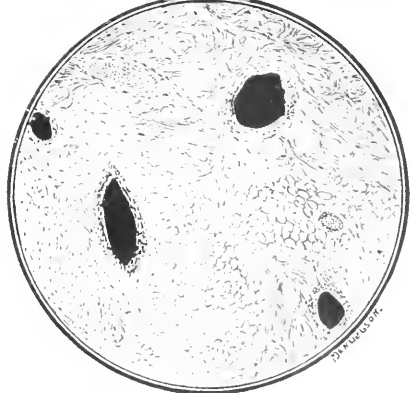


FIG. 5.—Ichthyotic condition of the skin in the lumbar region.



Section from a nodule of several years' standing showing fatty and amyloid degeneration.



From a nodule of many years' standing. Typical hard fibroma.



Showing fatty degenerative changes in old nodule.



Degenerated and calcified areas in a nodule of many years' standing



Secondary infection in a nodule. Not of a typical nature.



on spleen puncture. He has had no fever since his treatment with antimony was stopped.

In the beginning of 1919, he noticed faint whitish patches on his face. These gradually spread. The patches were neither anæsthetic nor hyperæsthetic. They gradually spread over the whole body in front and behind in about six months. He was at first treated with arsenic internally. The patches became worse during cold weather. Subsequently, papillomatous nodules appeared over the face, the trunk and the extremities.

Patient was seen by me very recently. I asked Dr. Ghose to make a very careful examination of the scrapings and the juice from the papillomatous nodules for the presence of Leishman-Donovan bodies. The smears showed a very large number of Leishman-Donovan bodies in some of the slides.

Liver and spleen normal. On examination of the splenic body by spleen puncture no Leishman-Donovan bodies were found. No rise of temperature. The patient complains of no other trouble, except the ugly appearance of the body due to the eruptions.

Result of blood examination on February 1, 1922: Hb. 75 per cent., red blood corpuscles 4,500,000, white blood corpuscles 10,000, polymorphonuclears 62 per cent., lymphocytes 24 per cent., large mononuclears 6 per cent., eosinophiles, 8 per cent.

The blood report does not at all correspond to that of kala-azar. No Leishman-Donovan bodies could be detected in the peripheral blood.

DESCRIPTION OF THE RASH.

(1) On the face there are papillomatous nodules somewhat resembling small leprotic nodules.

(2) There is a slight erythematous appearance on the cheeks and the forehead.

(3) On the trunk, the upper and the lower extremities, there are slightly raised brown patches which are extensively spread over the whole body. A few papules are also present in these parts.

(4) There are some erythematous patches in the extremities, especially the lower.

(5) No ulceration or scab formation in any part of the body. Other features—no anæsthesia, no loss of knee-jerks, no thickening of the nerves. No eruptions in the mucous membrane of the mouth and nostrils.

Three other cases were seen by me. Of these one resembled the present case in the rash being generalized over the whole body. The other two had less generalized rash, most of the papillomatous eruptions being present on the face, there being some brownish patches over the arms.

One of these cases was treated with further injections of antimony and he appeared to improve. The second one, a boy aged 15, was given six intravenous injections of tartar emetic in doses of 3 to 5 c.c., but he left treatment before any improvement was noticed.

Examinations of Scrapings.—Leishman-Donovan bodies are found in very large numbers, especially in the juice expressed from the papillomatous nodules.

A few have also been found from the brownish patches. No lepra bacilli.

Perhaps such cases are more common than have been suspected and more cases will be met with by observers who are treating kala-azar with antimonial preparations.

Cases of kala-azar showing Leishman-Donovan bodies in the papules of the skin have been described by Christophers. But they must be regarded as quite distinct from the above cases which no doubt seem to be cases of infection by Leishmaniasis Donovanii sine kala-azar as a result of antimonial treatment.

Much speculation has been held out regarding the interpretation of the findings in the above case. I was led to conclude that the lesions were caused by *Leishmania donovani* whose virus had been modified by antimonial treatment and that a deadly visceral leishmaniasis was converted into a benign cutaneous form. Megaw considers that it only proves the identity of the parasites of this particular form of dermal leishmaniasis with that of kala-azar. Wenyon considers that the disease may be an aggravated form of cutaneous eruptions sometimes present in kala-azar, as described by Christophers. Rogers has written to me that it is the result of insufficient antimonial treatment.

NOTE ON THE ETIOLOGY OF "CUTE."

By ALDO CASTELLANI and HENRI TEJERA.

IN Venezuela a skin disease called "cute" is fairly common, but so far very little attention has been paid to it and nothing is known about its etiology. The affection is characterized by the presence of bright yellow patches, not desquamating or very little, which have no tendency to spontaneous cure. The condition not rarely begins in childhood and very slowly spreads.

Illustrative Case.—Mrs. M., a South American lady, married, living in Europe for the last twelve months. The lady noticed the first patches of "cute" three years ago, since then they have slowly but steadily spread. At the present time there are several roundish or oval patches on the neck and right shoulder. The patches are of a slightly yellowish colour, smooth and very slightly elevated. There is no desquamation and they do not appear in any way to affect the general health, but naturally the lady objects to the disfigurement, which is especially marked during the summer months.

Microscopical and Cultural Investigation.—The examination of scrapings from the yellow patches treated with liquor potassæ, shows presence of very scanty spore-like bodies (3.5 to 4.5 microns) and a few mycelial articles. The sporiform bodies are roundish or oval and some of them show a double contour. The appearance of the fungus is very similar to the fungus described by one of us in Ceylon in *tinea flava*.

Cultivation.—Attempts at growing the fungus failed.

Discussion.—The symptomatology of cute seems to us to be identical with the affection described by one

of us in Ceylon under the name of *tinea flava*; both conditions presenting yellow patches which slowly spread, do not itch, and are, practically, non-desquamating.

CONCLUSIONS.

(1) We are not aware of any bacteriological and mycological investigation of *cute* having been carried out previously.

(11) The investigation carried out in our case seems to prove that Venezuelan *cute* is clinically



identical with the *tinea flava* of Ceylon and India described by one of us (C.) some years ago. Microscopically the fungus of *cute* seems also to be very similar or identical with the fungus of *tinea flava*. It is quite possible, however, that further investigation may prove that the two conditions, though clinically similar, may be caused by different fungi—in analogy to what is the case with so many other tropical dermatomycoses, such as *tinea imbricata* and Dhobi's itch.

ACLADIUM CASTELLANII (PINOY).

By R. CRAIK.

IN a paper in the *Transactions of the London Dermatological Society* for 1921, I tried to give a general view of the nature and relations of the ring-worm fungi, particularly of the microsporons. Incidentally I pointed out that Professor Castellani had

described an ulceration of the skin which was interesting because Professor Pinoy had referred the causative organism to *acladium*. It had occurred to me that such a form might be found with a pathogenic phase, because mycologically *acladosis* would be related to microsporon infections, just as *sporotrichosis* is related to trichophyton infections. However, I gave reasons for doubting whether this organism was an *acladium* at all. Professor Castellani replied by sending a culture, and this is the result of my examination.

The fungus is confusing till one observes that it occurs in two forms—the smooth and the rough culture. Growth proceeds quite well at 38° C., and very slowly at 10° C., with optimum at 25° to 30° C. Below 20° C. the culture tends to be smooth, with no conidiophores, but at the optimum is usually rough with numerous conidiophores. The nature of the medium is also of importance, as on wort agar conidiophores are often absent or scanty even at optimum temperatures, whereas on glucose agar conidiophores are usually well developed with numerous conidia. Excess of moisture retards conidiation, and cultures ripen first at the upper end of the tube.

On gelatine media at 20° C. there is liquefaction in about five weeks. Some cultures blacken as they age.

Smooth Culture.—On wort agar at room temperature in ten days one finds a whitish, pasty layer, which in a month is brownish in colour. Though uneven, the surface remains smooth and destitute of conidiophores. Microscopical examination shows:—

(1) Hyphae conspicuous, branching and septated (2 to 3 microns wide), with regular parallel walls and considerable intervals between septa.

(2) Portions of hyphae with rather close septation, having subdivided up into oidial elements (pseudo-conidia).

(3) Short moniliform pieces of mycelium often at the end of a branchlet.

All of these may be found in cultures of almost any of the lower fungi, and these are practically the only elements found in mycotic lesions in man.

(4) Spherical or ovoid elements, of a diameter much greater than the mycelium, interstitial or terminal or lateral on short offshoots. These are large, unicellular chlamydospores.

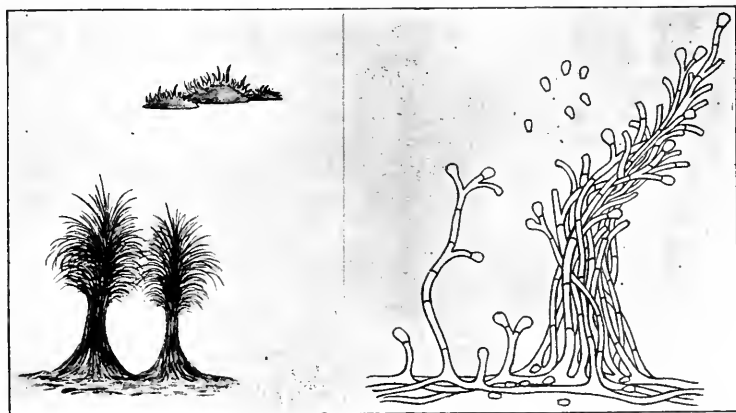
(5) Less frequently, elements comparable in size to the preceding but more elongated and sometimes with one or even two septa. They are usually on short lateral branches. These are little divided or only bicellular chlamydospores.

The striking feature is the number of large, unicellular chlamydospores. Though not so numerous, such are not uncommon in the microsporons. The more elongated, septated chlamydospores resemble the simpler spindles in some of the microsporons. The total absence of conidiophores and of true conidia recalls *Monilia audouinii* var. *equinum* (Bodin), in which on wart agar at room temperature the culture remains "absolument glabre," but at a higher temperature on a more suitable medium *acladium* conidiophores are developed as in other microsporons (Geddoelst, "Les champignons parasites," p. 106-110).

Monial Form.—This was found when stray conidia had germinated just beyond the edge of the agar. Examined through the tube with medium powers there were seen, towards the periphery of colonies, sub-erect branchlets divided at their extremities into oidial elements, which had budded into conspicuous clusters of conidia. This is probably a form of monial fructification similar to that described and figured under *M. sitophila* in Lafar's "Technical Mycology," vol. ii, pt. 2, p. 448.

Rough Culture.—This is well seen on glucose agar at 30° C. At first smooth, the surface in a few days shows tiny spicules, which soon spring up over the whole culture except at its margin. In a week this surface consists of fertile aerial hyphæ, most of them fasciculated into the spiky projections, which branch near the tip to bear numerous colourless pyriform conidia, 2 by 3 microns in size unicellular, solitary,

organism, and, as the highest known phase of its development, determines its botanical position. The true conidia placed terminally on branching conidiophores, which are obviously fasciculated, definitely exclude any acladium. Personally I regard the conidiophore as a depauperate verticillium form somewhat similar to *V. nanum* but gathered into bundles after the manner of the stilbæ. I have described and figured (*British Medical Journal*, 1921, i, 673) such a form of conidiophore in an unusually virulent microsporon. In Castellani's organism there is little or no evidence that it is a microsporon, and it is not a verticillium. Its chlamydospores resemble those of *M. audouini*; its smooth culture recalls the var. *equinum* (Bodin), and its rough culture reproduces the fasciculated conidiophores in the var. *verticillium* which I described, though it is doubtless further removed from microsporon. It is interesting to find



Left: Above, surface of culture slightly magnified; below, from a culture three days old. ($\times 100$.) Right: From a culture five days old showing conidia. ($\times 450$.)

terminal, with a facet of articulation when detached. In hanging drop these readily sprout. Chlamydospores are rare.

In the rough culture reproduction depends entirely on these minute conidia which are wholly absent in the smooth culture. In the latter the suppressed conidia are replaced by a lower form, the chlamydospores. In its pathogenic phase it is not to be expected that it can reach the chlamydospore, and probable that, like the ringworms, it must depend entirely on pseudoconidia (oidial elements) for dissemination and infection. If we could not grow the organism we could still see that it belonged to the forms with conspicuous mycelium, branching and septated (mycomycetes). If we had only growth in the smooth culture we could not say much more. But the rough culture indicates a more elaborate

the organism surmounting difficulties by means of the primitive monial-like conidiophore. Though I found no acladial conidiophores it is possible that under certain conditions these may be produced by an organism so variable. Even so, just as in the case of microsporon, it could not be regarded as an acladium and nothing more. Considering its complex character and its pathogenicity, I suggest the name "*Pseudomicrosporon castellanii*."

In conclusion I must thank Dr. Butler, of the Imperial Bureau of Mycology, for examining my microscopic preparations and for advice; the Clinical Research Association, for the great help they gave me in cultures at various temperatures; and Miss Cole, for sketches which make the description intelligible.

TRICHOMYCOSIS AXILLARIS FLAVA, RUBRA AND NIGRA.¹

By ALDO CASTELLANI, C.M.G., M.D., F.R.C.P.,

AND

A. GEDEN WILKINSON, M.B., Ch.B., D.P.H., D.T.M.,

DURING the summer months of 1920, 1921 and 1922 we carried out an investigation on the frequency of trichomycosis axillaris in patients admitted to the Tropical Section of the Orpington Hospital. We found that the incidence of the infection in summer is extremely high, more than 80 per cent. of the patients admitted being affected. In hospital only one variety of trichomycosis was noted—the yellow variety. In private patients, in addition to the yellow variety, we have found two cases of the red and one of the black variety; the observation was made during the spell of very hot weather at the end of July, 1921, and the three patients had just arrived from Ceylon, all by the same boat. Very recently a third case of trichomycosis rubra was observed by one of us in a patient who had never left Europe.

Most of the patients seem to have contracted their trichomycosis in tropical and sub-tropical countries, but it was found also in individuals who had never been out of England or France. To show the frequency of the affection we found that out of fifty-seven patients admitted to two of our wards at Orpington, fifty-one showed the condition.

GENERAL REMARKS.

Some remarks on trichomycosis axillaris principally based on the observations and researches of one of us (C.) in the tropics and various European countries may not be out of place, as there still appears to be a great deal of confusion concerning the affection, especially as regards its ætiology.

SYNONYMS. HISTORICAL AND GEOGRAPHICAL.

Trichomycosis axillaris, which is also known as lepothrix (*pro parte*), trichomycosis palmellina (*pro parte*), trichonocardiasis axillaris, trichomycosis nodosa, trichomycosis chromatica, chromatrichomycosis, Castellani's trichomycosis, &c., has been known for many years, but only recently its various clinical types has been differentiated by one of us (C.) and the ætiology of each elucidated.

Paxton, in 1869, described a nodular affection of the hair of the axillary and genital regions, which was later named lepothrix by Wilson. Paxton's work was confirmed by Patteson and Pick, who called the condition trichomycosis palmellina. Payne, Eisner, Sonnenberg, Babes and Barthelemy carried out investigations on the ætiology of the condition and described various bacteria, including *Bacillus prodigiosus*, as causative agents. In 1911, Castellani, working in Ceylon, differentiated three

varieties of the affection—the yellow variety due to a fungus which he called *Nocardia tenuis* (*Discomyces*, *Streptothrix*, *Cohnistreptothrix tenuis*); the black variety due to the same fungus plus a black pigment-producing coccus, which he called *Micrococcus nigrescens*; and the red variety, due to the same fungus plus a red pigment-producing coccus, to which later Chalmers and O'Farrell gave the name *M. castellani*. These two authors called the condition trichonocardiasis. Recently Macfie has thoroughly investigated the condition in West Africa and has described a sub-variety of it, which he has called trichomycosis fusca.

ÆTIOLOGY AND PATHOLOGY.

As already stated, the most widely different organisms have been described as causative agents by various observers. In 1911, one of us, studying the condition in the tropics, separated three principal varieties of the affection—the yellow, the black and the red—and carried out some researches with the object of elucidating their ætiology. His researches showed that in the yellow variety a minute fungus was constantly present in enormous numbers (*N. tenuis*, Castellani, 1911; syn.: *Streptothrix*, *Discomyces*, *Cohnistreptothrix tenuis*, Castellani). In the black variety he found the same fungus plus a black pigment-producing coccus, *M. nigrescens*, Castellani, 1911, living in symbiosis with it; in the red variety he observed the same fungus plus a red pigment-producing coccus living in symbiosis with it, which later was called *M. (Rhodococcus) castellani* by Chalmers and O'Farrell, who made a very thorough investigation of the affection in the Sudan in 1913.

The microscopical examination of the affected hair with low power shows that the shaft is covered at several places by roundish formations, partially or totally encircling it. Under a high power, using a cleared specimen, these formations will be seen to consist in the yellow variety of enormous numbers of the bacillary-like mycelial hyphæ of *N. tenuis*, embedded in an amorphous cementing substance. In the red and black varieties, in addition to the masses of bacillary-like bodies which are the mycelial segments of *N. tenuis*, large groups of coccus-like bodies are observed (*M. nigrescens* in the black variety and *M. castellani* in the red variety).

Nocardia tenuis, Castellani, 1912. (Syn.: *Discomyces*, *Streptothrix*, *Cohnistreptothrix tenuis*, Castellani, 1912.)

The microscopical examination of the nodules in cleared specimens reveals the presence of enormous numbers of rod-like bodies—the bacilliform hyphæ of a nocardia—which are Gram-positive, but not acid-fast. If the nodules are kept in alcohol or formalin for several months the fungus apparently loses partially or totally its property of being stainable by Gram's method. The bacillary bodies vary in length from 2 to 8 microns and more; the average breadth is approximately 0.14 to 0.3 microns; they

¹ Amplification of a paper published in the *British Journal of Dermatology and Syphilis*, vol. xxxiv, pp. 255-266. Blocks kindly lent by Messrs. H. K. Lewis and Co., Ltd.



1, *Micrococcus nigrescens*, Castellani (glucose agar culture). 2, *Micrococcus castellanii*, Chalmers and O'Farrell.
3, *Trichomycosis flava*. 4, *Trichomycosis nigra*. 5, *Trichomycosis ruhra*. 6 and 7, *Nocardia tenuis*
from hanging-drop culture.

To illustrate paper on "Trichomycosis Axillaris Flava, Ruhra and Nigra," by ALDO CASTELLANI, C.M.G., M.D., F.R.C.P.,
and A. GEDEN WILKINSON, M.B., Ch.B., D.P.H., D.T.M.

may be straight or slightly bent, very seldom if ever branching; they are fairly closely packed together, and are embedded in a cementing substance, apparently secreted by the fungus. This ground substance is fixed to the cortex of the hair, and a portion of it lies under the cuticle and some of the superficial layers of the cortex. In regard to cultivation, Chalmers and O'Farrell observed some slight growth in hanging drops of equal parts of human serum and normal saline. The fungus grew, showing branching forms and coecal forms (Coloured Plate: 6 and 7). The branching was non-podoidal and the hyphae were non-septate. Macfie, in one case, succeeded in cultivating the fungus on ascitic sugar agar, the colonies being very small and translucent.

Micrococcus (Nigrococcus) nigrescens, Castellani, 1911.

This is a Gram-positive, rather large, non-motile coccus, which in certain media may take the appearance of a coccobacillus. It produces a black pigment. Sugar media are more suitable for the growth of the organism than the ordinary agar.

Sabouraud Maltose Agar.—Colonies appear twenty-four to forty-eight hours after inoculation. They are roundish, at first white, but after a couple of days the centre of each colony turns black, and the pigmentation slowly spreads eccentrically. After a time the colonies may coalesce into a jet-black mass.

Glucose Agar.—Growth similar to Sabouraud, but slightly less abundant. The black pigmentation develops from the centre of the colonies and slowly spreads towards the periphery (Coloured Plate: 1).

Levulose Agar.—Identical to glucose.

Saccharine Agar.—The pigmentation is less pronounced, and does not spread to the whole of the growth.

Raffinose Agar.—Same as saccharine.

Lactose Agar.—Scanty pigmentation.

Alkaline Maltose Agar.—Black pigmentation well marked, though in many cases it does not extend to the whole of the growth.

Acid Maltose Agar.—Growth less abundant than on acid maltose. Black pigmentation well marked.

Mannite Agar.—As alkaline maltose.

Inulin.—As alkaline maltose, but pigmentation less pronounced.

Saccharose.—As inulin agar.

Glycerine Agar.—Abundant growth, the whole of which after a time becomes a jet-black colour.

Galactose.—As inulin.

Adonite.—As acid maltose.

Ordinary Agar.—Growth much less abundant than on most sugar agars, and black pigmentation less marked.

Serum.—Growth fairly abundant, but there is only a trace of pigmentation. The medium is not liquefied.

Gelatine.—No liquefaction. The growth on the surface shows after a time some dark pigmentation, but the growth along the stab is white.

Milk.—No change.

Broth.—General turbidity. A thin pellicle is often present. The microscopical examination shows cocci arranged in pairs or irregularly. They do not appear to be encapsulated.

Peptone Water.—Some growth at the bottom, while the rest of the tube is clear.

Sugar Broths.—No formation of acid or gas.

Indol.—Most strains produce a trace of indol.

Micrococcus (Rhodococcus) castellanii, Chalmers and O'Farrell, 1913.

This coccus, isolated in 1910 by Castellani from the red variety in Ceylon, and later further investigated in the Sudan and named by Chalmers and O'Farrell, is more difficult to isolate and to grow than the coccus observed in the black type of the affection. It is interesting to note that as a rule it grows better and shows more pigment on ordinary agar than on sugar media. It is a round or oval coccus, measuring from about 0.3 to 0.7 microns in diameter. It is separated medianly by a clear central line into two half-moon-shaped segments, thus producing a diplococcal appearance. It is colourless and non-motile, but excretes an amorphous non-granular lemon chrome-coloured pigment. In old cultures another pigment of dark brownish-red colour appears (according to Ridgway's standards this colour is madder-brown), but its relationship to the earlier yellow pigment can easily be proved, as demonstrated by Chalmers and O'Farrell, by removing some of it and suspending in a sufficiency of distilled water, when the fluid at once resembles a similar suspension of the yellow pigment. When, however, this is done in a very small quantity of water, a faint reddish tinge can be observed. The best medium for showing the striking *yellow pigment* is the potato, when in twenty-four hours the growth assumes that colour. The *red pigment* shows best in the ordinary agar slope, which, when old, exhibits the dark red pigment in the centre and the yellow pigment at the sides (Coloured Plate: 2). The organism is easily stained by all the ordinary staining reagents, and is Gram-positive. However, even in preparations showing most of the cocci well coloured by Gram's methods a few cocci may be seen decolorized, and occasionally one may see cocci with one demilunar segment well stained while the other is completely decolorized. The organism does not appear to have a capsule.

The coccus grows aerobically and also anaerobically. The optimum temperature appears to be 37 °C.; it also grows at 20° C. on agar slopes, but not as abundantly as at 37° C., and the pigmentation is much less marked. Its rate of growth depends somewhat upon the medium; it grows quickest on potato, and next best on ordinary or glycerine agar. On solid media it gives rise to a yellow growth at first, but on most media, if kept long enough, some red coloration will subsequently be found. The best medium for the red coloration, as already stated, appears to be the ordinary agar slope. With regard to the other agar media, it grows well on glucose and maltose agar. Like *M. nigrescens* it produces neither acid nor gas in

glucose, levulose, galactose, arabinose, lactose, saccharose, raffinose, dextrin, inulin, amygdalin, erythrite, adonite, dulcitol, isodulcitol, mannitol, sorbitol or inositol. It grows slowly on blood-serum, which it does not liquefy, and well in broth and peptone water, in which it forms a general turbidity. Gelatine is not liquefied. It does not produce indol.

In agar slabs the growth is confined to the line of puncture and to the formation of a small yellow knob on the surface.

Classification of *Micrococcus castellanii*.—Chalmers and O'Farrell have thoroughly investigated this point: "The organism belongs to the family *Coccaceae* (Zopf, emended Migula), and must be grouped with the genus *Micrococcus* (Hallier, 1866, emended Cohn, 1872). In this genus it certainly belongs to those forms which grow well on agar media and are Gram-positive, and in this division it belongs to the sub-division which produces colours.

"The cocci of this sub-division which possess red coloration are only three in number—*M. roseus* (Baum, 1885), *M. ruber* (Trommsdorff, 1904), and *M. rubidus* (Hefferan). Under the term *M. roseus* (Baum, emended Lehmann and Neumann) are gathered a large number of rose-coloured diplococci which are not known to be parasitic, and which produce growths on potato which are limited to the streaks. These growths are faint rose colour with an oily lustre, and are often surrounded by a whitish glistening zone, thus giving rise to a very different appearance from that produced by *M. castellanii*. *M. ruber* (Trommsdorff, 1904), or, as it is sometimes named, *M. chromidrogenus ruber* is characterized by the fact that it does not grow on potato; its colouring matter is not soluble in water, and when treated by sulphuric acid the red colour turns blue-green, while *M. castellanii* does grow on potato and its colouring matter is unaffected by 25 per cent. sulphuric acid; it appears to be closely related to *M. roseus* var. *carneus*, and to be non-parasitic."

PATHOLOGY.

From our own observations and those of Chalmers and O'Farrell it would appear that when the nocardial fungus first attacks the hair, it grows and



FIG. 1.—*Trichomycosis flava*.

pushes its way under a cuticular scale and then works its way into the cortex, raising, in so doing, its superficial fibres, which, together with the cuticular scale, form a covering or protection for the fungus, which probably finds its nutriment in

the cortex. The fungus does not penetrate very deep into the cortex, but grows outwards, forming the characteristic nodules. This method of growth explains why the hair is so little affected; the deeper layers of the cortex, the medulla, and the root of



FIG. 2.—*Trichomycosis nigra*.

the hair are not involved, though the hair at times loses its lustre. In an early stage of the infection the cuticle and some fibres of the cortex may be seen to be raised in ridges, which run in wavy lines across the shaft of the hair transversely to its long axis; masses of the fungus may be seen growing under these ridges. A nodule consists of a mass of the rod-like hyphae of the *Nocardia* embedded in a firm homogeneous ground substance. In the black and red varieties the nocardial masses are surrounded by large numbers of cocci—*M. nigrescens* in the case of *Trichomycosis nigra* and *M. castellanii* in the case of *T. rubra*.

SYMPTOMATOLOGY.

***Trichomycosis flava*.**—The affected hairs of the axilla and pubes present nodular formations of a yellow, and, occasionally, yellow-greyish colour, plainly visible to the naked eye, of rather soft consistency in the tropics, being easily removed by scraping with a triangular needle or any similar instrument (Coloured Plate: 3, and fig. 1). The nodules are much harder and generally of much smaller size in temperate zones, so much so that at one time one of us considered that there were two distinct clinical varieties of *trichomycosis flava*—the tropical variety, characterized by the nodules being large, soft, and easily removed, and the European variety or *leptothrix, sensu stricto*, characterized by the nodules being hard, small and difficult to remove. The microscopical examination of cleared specimens shows the formations to consist solely of enormous numbers of bacillary-like bodies—the rod-like hyphae of *N. tenuis*, Castellani, embedded into an amorphous cementing substance. *Trichomycosis flava* affects the hairs of the axillary regions, and more rarely those of the pubes. The affected hairs may occasionally become lustreless and somewhat depigmented.

***Trichomycosis nigra*.**—The nodules are generally of the same size and consistency as those in *trichomycosis flava*, but are of a black colour (Coloured Plate: 4, and fig. 2). The microscopical examination shows masses of rod-like nocardial elements (*N. tenuis*), surrounded by large numbers of cocci

(*M. nigrescens*) (fig. 3). *T. nigra* appears to affect only the axillary hairs, as we have never come across trichomycosis nigra of the pubic hairs.

Trichomycosis rubra.—The nodules are red (Coloured Plate: 5), but the red pigmentation is of varied intensity, and Macfie has described a subvariety of less vivid colour than usual which he has called *T. fusca*. The microscopical examination shows the nodules to consist of large masses of nocardial elements (*N. tenuis*), surrounded by masses of a coccus (*M. castellanii*). Trichomycosis rubra may affect both the axillary and the pubic hairs.

Mixed Types.—It is not at all rare in the tropics to find patients affected with two varieties of trichomycosis: the hairs of the one armpit may show the yellow variety, while the hairs of the other armpit may present the black type or the red type. At times the same individual hair may present some of the nodules yellow and others black

was found that the hairs were infected with the red variety of trichomycosis—that is to say, with the variety which he saw and handled in abundance. It grew rapidly on the pubic hairs, but did not extend to the axilla."

This observation tends to show that the incubation period is about two weeks, this being the length of time necessary before the infection produces sufficient growth on the hairs to attract attention.

COMPLICATIONS.

In acute cases in which the infection is very heavy an erythematous condition of the axilla may be observed. Hyperidrosis is common, but so far we have come across only one case of chromidrosis associated with trichomycosis. In certain cases we have noticed a yellowish discoloration of the skin of the axilla, and in one case which was more completely investigated a nocardial fungus was

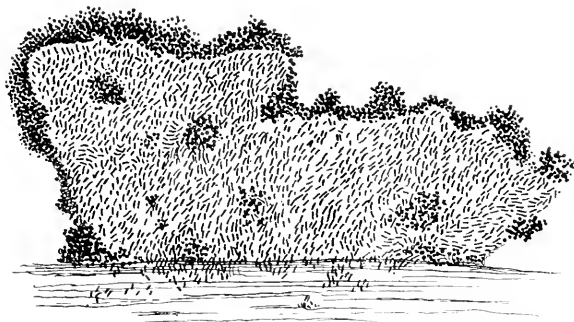


FIG. 3.—Nodule of trichomycosis nigra, cleared specimen. Note bacilli-form hyphae of *Nocardia tenuis* and masses of cocci (*Micrococcus nigrescens*).

or red. We have not yet observed all the three varieties present at the same time on the same patient.

METHOD OF INFECTION.

The usual method of infection appears to be from man to man. This is strongly supported by the following observation made by Chalmers and O'Farrell in the Sudan:—

"A young European, known to be quite uninfected with trichomycosis, became greatly interested in the work carried out on the condition at Khartoum. He examined cases which came to the laboratory, and handled and examined fresh hairs removed from the axilla. When he visited the laboratory he was clad in tennis attire, and as he moved about his shirt rucked up from below repeatedly, and whenever this occurred he adjusted it by pulling forward his leather belt with one hand while he pushed the soft shirt downwards inside his trousers with the other. Two weeks after examining cases he first noticed a reddish appearance on the hairs of the pubes. On examination it

found in the patches very similar or identical with *N. tenuis*.

DIAGNOSIS.

This is very easy, being based on the presence of yellow nodules (trichomycosis flava), red nodules (trichomycosis rubra), and black nodules (trichomycosis nigra) on the hairs of the axilla and pubes.

DIFFERENTIAL DIAGNOSIS.

The various types of trichomycosis have to be differentiated from Cheadle and Morris's *tinea nodosa* (known also as Beigel's trichosporosis), Behrend's nodular trichosporosis (Behrend's trichosporosis), Piedra (trichosporosis tropica), Unna's *piedra nostras* (Unna's trichosporosis), and finally Du Bois's trichosporosis. The differentiation is quite easy in the case of trichomycosis nigra and rubra, as none of the above conditions show any black or red pigmentation. These conditions are easily differentiated from trichomycosis flava, as they seldom, if ever, attack the axillary hair, and their causative fungi belong to the genus *Tricho-*

sporom, Behrend, 1890. The hyphomycetes belonging to this genus are of much larger dimensions and show totally different morphological characters from *N. tenuis*. The fungi of the genus *Trichosporum* are arthrospores living parasitically on the hairs in the form of large oval or roundish bodies, varying in diameter from 3 to 4 microns to 12 to 15 microns. Fungi of the genus *Nocardia*, Toni and Trevisan, on the other hand, are bacilliform, and usually 1 micron or less in diameter (see Castellani and Chalmers' "Manual of Tropical Medicine," third edition, p. 1101).

Tinea nodosa, often known as Beigel's trichosporosis, is first described by Cheadle and Morris in London, and later by Beigel in Germany. It is a nodular affection of the hair of the scalp and is caused by *Trichosporum beigelii* (Rabenhorst, 1867).

Behrend's trichosporosis (Behrend's nodular trichomycosis) affects the hair of the beard and is due to *Trichosporum ovoides* (Behrend, 1890).

Unna's trichosporosis, or *pieclia nostras*, is very similar to Behrend's trichosporosis; it attacks the hair of the moustache and beard, and is due to *Trichosporum orale* (Unna, 1896).

Trichosporosis tropicalis (*pieclia*) is common in certain parts of South America; it generally affects the hair of the scalp, and is characterized by the presence of extremely hard nodules, hence the name *pieclia* (stone). It is caused by *T. giganteum* (Behrend, 1890).

Du Bois's trichosporosis has been observed on the pubic hair of persons suffering from diabetes and is caused by *T. glycopile* (Du Bois, 1910).

PROGNOSIS.

None of the varieties of trichomycosis axillaris has a tendency to spontaneous cure while the patients reside in a hot tropical country. On the patient going to a cold climate the condition may subside or even disappear completely. Trichomycosis nigra seems to disappear in a cold climate much more rapidly than trichomycosis flava or trichomycosis rubra.

Trichomycosis axillaris is an affection of not much importance, but we have known European ladies in the tropics greatly distressed by it, as when they wear low-necked dresses the disfiguring red or black patches in the axillary regions are quite visible. It is a curious fact also that natives when affected with trichomycosis seem to regard it with disgust and readily seek treatment, and Chalmers and O'Farrell have brought forward the hypothesis that the general custom of shaving the axillary hair among certain native tribes may have originated in their profound dislike of this complaint.

TREATMENT.

The treatment originally used by one of us in Ceylon is generally efficacious. The affected hairs are dabbed twice daily with an alcoholic solution of formalin (formalin 5j, spir. rect. ad 5vj); at night a 2 to 5 per cent. sulphur ointment is rubbed in. To allay the irritation of the skin at times caused by this treatment, calamine lotion may be

applied. Resorcin and salicylic alcoholic solutions have also been used, but as a rule they are not so efficacious. Tr. iodine alone has practically no effect, but is useful in obstinate cases after a few days of the formalin-sulphur treatment. Chrysobarin ointment is very messy and does not induce any striking improvement. The application of ether, chloroform, or creosote occasionally causes an improvement, but the skin is often irritated. Dabbing the parts with a strong solution of lysol is at times efficacious.

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THE ETIOLOGICAL FUNGI OF TINEA VERSICOLOR AND TINEA FLAVA.

By Major FERDINAND SCHMITTER.

Medical Corps, United States Army.

TINEA VERSICOLOR is a well recognized skin disease which scarcely needs any description. In the earlier literature it is usually called pityriasis versicolor, the term pityriasis being clinically applied to all branny skin lesions. With the advent of dermatomycology it has become quite general practice to apply the term *tinea* to fungus skin lesions. The fungus causing the disease is said to have been first recognized by Eichstedt, of Greifswald, in 1846. It has been variously named by authors, as shown by the following synonyms:—

Microsporum furfur, Ch. Robin, 1853.

Sporotrichum furfur, Saccardo, 1886.

Malassezia furfur, Baillon, 1889.

Oidium furfur, Zopf, 1890.

Oidium subtile, Kotljars, 1892.

Hallier, 1886, cultivated an organism in glycerine which he believed to be *Microsporum furfur*. His drawing shows forms of what he calls "hefezellen" (yeast cells), which appear to be identical with one stage of an organism which I have cultivated.

Von Sehlen, 1889, cultivated an organism from pityriasis versicolor, which failed to reproduce the disease on inoculation. His description and photomicrographs make it certain that he had some other mould than *Malassezia furfur*.

Kotljars, 1892, cultivated an organism which he believed to be the cause of pityriasis versicolor. His organism grew with variegated colours on potato, and failed to liquefy gelatine, both essential differences from my cultures.

Spietschka, 1896, did an apparently careful piece of work in which he cultivated the same organism from twelve cases, and reproduced the skin lesion. His organism does not resemble those which I have cultivated. If his work is correct there is probably more than one organism which may cause clinical tinea versicolor.

Matzenauer, 1901, and Vörner, 1902, claim to have confirmed Spietschka's work in cultivating the organism and reproducing the disease.

In Kaposi's textbook is a drawing of *Microsporon furfur* which has been copied by both Hyde and Crocker. It shows a branching mycelium with spores at the joints of the hyphae. This appearance may be harmonized with the descriptions of Spietschka, Matzenauer and Vörner. I have never seen a like

tinea flava, but I believe that I have obtained a difference in cultures.

In attempting to cultivate the fungus of tinea versicolor I failed at first to get anything resembling the organism as found on examining the scales directly in specimens prepared with potassium hydroxide, glycerine or the usual stains. Instead I persistently found a heavy bacillus. Glycerine agar cultures of this bacillus allowed to stand for several weeks developed 1 mm. to 2 mm. crateriform spots on the surface, which on examination showed peculiar forms best described as resembling snakes, worms and larvæ. At first I suspected that they were contaminations, but after re-plating them several times it became evident that they were a later development of the bacillus in question.

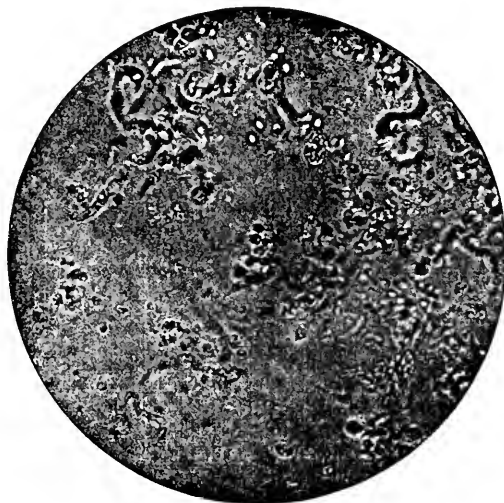


FIG. 1.—Glycerine agar culture in water $\times 900$ from the patient shown above.
(Photographed from the Bureau of Science, Manila.)

organism in the scrapings I have made from cases of tinea versicolor. On the other hand, Stellwagon's textbook gives an illustration which is identical with that I have always found. Perhaps these differences explain why authors have variously classified the fungus of tinea versicolor as microsporon, sporichium, malassezia and oidium.

Castellani, 1905, recognized that tinea flava, formerly confused with tinea versicolor, was due to a different organism, and named it *Malassezia tropica*. He states that attempts at cultivation of both forms of malassezia have failed. His illustration shows an organism similar to that of Stellwagon for tinea versicolor. I have never been able to see any absolute difference in the appearance of the fungus seen in the scrapings from tinea versicolor and

The organism proved to be extremely pleomorphic, developing bizarre forms which defy description. Among these forms were the "hefezellen" of Hallier, previously mentioned, and ring forms as seen in the scrapings, but the typical square-jointed hyphae seen in the fresh scrapings never appeared in the artificial cultures.

The cultural characteristics of the organism are as follows:—

Glycerine agar shows a free, glistening, yellowish growth along the streak, which in a few days becomes elevated, and takes on a greasy appearance, with a light butter or fat colour. Gradually the margin develops a ripple or two, and the surface shows a tendency to crinkle. After about a week tiny whitish raised dots appear on the surface. These enlarge

during about another week to about 2 mm. diameter, and the centre sinks making them crateriform. After several months of artificial cultivation these craters decrease or disappear. The cultures have a slight odour, suggestive of butyric acid, as observed in clogged sweat glands or sebaceous cysts.

Sabouraud's maltose agar gives a light glistening streak, which in a few days develops into a coffee and milk coloured film, never becoming elevated or showing craters.

Plain agar develops a light greasy-looking smooth growth.

Ten per cent. gelatine at 37° C. is liquefied as found by chilling a culture in an icebox after twenty-four to forty-eight hours' incubation.

Plain bouillon in twenty-four hours appears clear with sediment. In forty-eight hours it becomes cloudy, and later clears, developing a heavy sediment.

Dunham's solution becomes cloudy in twenty-four hours. After eight days it becomes clear with sediment.

Indol is produced in a few days, and after fifteen days gives an intense deep red. For this reaction Dunham's solution made with Witte's (Kahlbaum) peptone was used with ten drops of concentrated H_2SO_4 and 2 c.c. of a 0.01 per cent. solution of $NaNO_3$.

Glycerine agar plate inoculated in centre showed in ten days a growth 1 cm. by 1.5 cm. of a light yellow butter colour, elevated, slightly crinkled and surface



FIG. 2.—*Tinea versicolor* fungus, *Malassezia furfur*, from scrapings in five per cent KOH. $\times 900$.
* From the same patient.

Litmus milk does not change its reaction, but clots in two days, decolorizes and becomes mostly peptonized in ten to twenty days.

Litmus bouillon produces acid, but no gas with the following carbohydrates: dextrose, levulose, maltose, saccharose, lactose, galactose, raffinose, glycerine, dextrine and mannit. Produces no change in adonite and inulin. Decolorization of the litmus is slight with most of these sugars, but especially marked with lactose and galactose.

Potato gives a creamy growth in one day, which becomes elevated and more yellowish as it becomes older.

stippled. At thirty days it was 1.5 cm. by 2 cm. with the same appearance.

Sabouraud's agar plate in ten days showed a growth 3 cm. by 4 cm., somewhat in the form of a clove leaf, it was flat, with a glistening surface of coffee and milk colour, translucent in the middle and opaque toward the margin. In thirty days it had the same appearance, reaching 4 cm. by 5 cm. in size.

An anaerobic culture on glycerine agar developed a slight transparent growth in twenty-four hours which did not increase in fifteen days. A twenty-four aerobic culture was made anaerobic, and the growth decreased during fifteen days. Both remained

alive, as manifested by their development after air was admitted.

Temperature Effects.—Glycerine agar cultures kept at 37° C. for two weeks developed a little more quickly than at room temperature but the crater on the surface did not develop as well. Cultures kept at 37° C. for two weeks and then at room temperature for six weeks were dead at the end of that time, while cultures kept the same time at room temperature remained alive. The lack of viability under such conditions distinguishes this organism from common spore-bearers whose viability is notorious for its persistence.

Oxalate crystals with their characteristic octahedral form were observed in old cultures, a feature

The best time for observation is on cultures from one to two weeks old. A hanging drop of such a culture shows a multitude of forms. Motility is very active. There are large refractile coccus, diplococcus, diplococcus and bacillus forms. Some bacilli are barred and some vacuolated. The spindle forms may be short and thick or long and slender. They may be bent at angles or U shaped, often containing refractile ring forms. The ring and oval forms resemble yeasts and may be seen budding or dividing transversely. From the ring forms a pseudopod-like projection may appear which expels fine granules. Occasional appearances suggesting conjugation may be seen. Several rings may appear in one mass making giant forms. Refractile oval spores may be



FIG. 3.—Same as fig. 2 prepared by Gram's method. $\times 900$.

which this organism holds in common with many fungi.

The microscopic appearance of the organism is extremely variable. On Sabouraud's maltose agar it appears as a heavy bacillus which in a few days tends to develop into a long flexuous spindle with bars and vacuoles. These forms do not become numerous as they soon break up into spores, and in old cultures we have a mass of oval spores.

The glycerinated cultures, either agar or bouillon, show the most interesting forms. In twenty-four hours they appear as large bacilli but in a few days the spindle and other odd forms begin to appear.

alone or in chains as if formed from a breaking up spindle form.

I have never seen branching of the hyphae, either in scales or in cultures, but in one-month-old glycerine bouillon cultures I have seen branching projections apparently sporophores with oval shaped terminals.

The organism stains positive by Gram's method, but some parts fail to take any stain.

Experiment I.—A culture was rubbed into an abrasion on the inner surface of a rabbit's ear, but the result was negative.

Experiment II.—A culture was rubbed into an abrasion on a man's chest. The ring forms were

later found, but this man was a frequent subject of prickly heat and inasmuch as I have found the same organism in heat rash it is probable that he had the same infection in a latent form before I inoculated him.

Experiment III.—Culture rubbed into an abrasion on man's chest. The abrasion soon healed. After two months a freckle-like spot appeared at the site of inoculation. Ring forms but no hyphae were found in scrapings and an organism like the original was cultivated from the lesion.

While this experiment is not conclusive the same may be said of the results obtained by the authors quoted above because the better part of a year elapsed between inoculation and observation during which time the patients might easily have acquired infection of an organism universally distributed.

The organism which I have described was cultivated from four cases of *tinea versicolor* and one case of *tinea flava*. Three of the cases of *tinea versicolor* were in white men, two of whom had just arrived from the United States. One case was in a Filipino whose whole skin was furfuraceous but not decolorized. The case of *tinea flava* in a Filipino showed only a light degree of decolorization, and, perhaps, should not be regarded as a case of true *tinea flava*. Of the cases of heat rash one was the patient mentioned in Experiment II, the other was a man who, while tearing down an old shed, got his arms covered with dust from between the boards. Wherever the dust touched heat rash developed. In the boil case, smears from the pus, stained with methylene blue showed in addition to the usual staphylococci, ring forms and budding forms like yeast which caused a suspicion of blastomycosis. The culture of *Malassezia*, however, explained the origin of the forms.

From these cases we may reason that *tinea versicolor* is not the harmless skin lesion usually supposed, but persons so affected are chronic carriers of a parasite which under favourable climatic conditions will cause heat rash and other skin lesions in themselves and others.

From two cases of *tinea flava* I have cultivated a different species of a similar organism. Its differences from the previously described organism are as follows: Glycerine agar cultures do not produce white spots or craters on the surface. Litmus in bouillon cultures is more strongly decolorized. In lactose bouillon the litmus does not show acidity. If present it is transient and masked by the decolorization. Indol is not produced.

These cultural findings harmonize with Castellani's clinical distinction between *tinea versicolor* and *tinea flava*, hence I regard, tentatively at least, the organisms of the first-described culture as *Malassezia furfur* and the second as *Malassezia tropica*. While the findings from this small number of cases is not conclusive, we hope to increase the number of observations so that inductively we may either confirm or deny the indications of our present findings.

PHOSPHORUS IN THE TREATMENT OF DERMAL LEISHMANIOSIS.

By ALDO CASTELLANI, C.M.G., M.D., F.R.C.P.

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A FEW months ago I published in the *British Medical Journal* (February 17) three cases of oriental sore successfully treated with injections of phosphorus. I am now in a position to add a fourth case. For the reader's convenience it may be of advantage to describe again the general technique of the treatment and quote briefly the first three cases.

METHOD.

A sterile 20 minims all-glass hypodermic syringe is used; 5 minims of the oil are drawn in and injected into and around the lesion by inserting the syringe in two or three places in the nodule itself and under the skin around the periphery; if the lesion is ulcerated two or three drops of the oil, in addition, are dabbed on the fundus of the ulcer after removing the crust. The injections are given once or twice a week.

The result in all four cases has been very satisfactory, evidence of incipient healing appearing almost immediately after the second or third injection, and an apparently complete cure being obtained within three weeks to two months.

Case 1.—A demobilized Army officer, aged 26, contracted oriental sore six months ago in Persia—one large non-ulcerated nodule and a partially ulcerated one—both on the left forearm. Microscopical examination of both lesions showed the presence of *Leishmania tropica* Wright. The patient had had severe malaria and had been treated with large doses of quinine. He had had no treatment of any kind for the sore. I gave him altogether seven injections (5 minims each) of phosphorated oil at rather irregular intervals, as he could not come to see me very regularly. The actual injections were painless; after a few hours there was a slight local reaction, the lesions becoming slightly oedematous, and the surrounding skin slightly reddened. Symptoms of rather severe general reaction occurred once; after the third injection the patient had fever (102°) and felt chilly and unwell, with rheumatic pains all over the body. The symptoms may have been due in reality to his old malaria, as the temperature fell to normal, with sweating within twenty-four hours; I could, however, find no malaria parasites in the blood. The open sore healed very quickly within two weeks, a smooth white scar being left; the non-ulcerated nodule took six weeks to disappear.

Case 2.—A young married woman (British), aged 24, presented on the left wrist a small smooth nodule, with a few scales at the apex and no signs of ulceration. Microscopical examination showed it to be an oriental sore, contracted apparently two months earlier in India; the first sign of it appeared during the voyage home. Six injections of phosphorated oil (two a week) were followed by complete disappearance of the lesion within three weeks.

The injections were never painful, the local reaction was very slight, and there was never any sign of general reaction.

Case 3.—An Englishman, aged 22, had contracted oriental sore seven months earlier in Iraq. There was one very large nodule on the left forearm, ulcerated at the top and covered with a thick crust. Microscopical examination was positive. The patient said that the condition had been treated with intravenous injections of tartar emetic without any benefit; it had also been considered to be of syphilitic origin and treated with salvarsan unsuccessfully. He was given an injection of phosphorated oil (5 minims) twice a week into the nodules, and at several places under the skin and around it. The lesion took two months to heal completely.

Case 4.—A young Englishman, 23 years of age, contracted oriental sore in India in December last. Did not consult a medical man, and treated it by the external application of carbolic. Came to consult me for chronic malaria six weeks ago. On the left forearm were two typical, partly ulcerated sores. Microscopical examination showed presence of *L. tropica* in very small numbers, but the parasites were typical. He has been given injections of phosphorated oil twice a week into the nodule and subcutaneously for five weeks and the sores are now healed.

DISCUSSION.

The method has been successful in these four cases, which are all I have treated. The following points should be kept in mind: First of all, it is essential that the phosphorated oil should be of recent preparation; old phosphorated oil is inert. The phosphorated oil I have used is *oleum phosphoratum B.P.* The injections are practically painless, but after a few hours there may be some local reaction, the lesions becoming slightly swollen, and the skin around them somewhat reddened; apparently severe general reaction is rare; a reaction lasting twenty-four hours occurred after the third injection in Case 1, but the patient was an old malarial subject, and the condition—though I did not find any malarial parasites—may have been malaria, especially as it terminated in sweating.

Phosphorus is a powerful poison, and its delayed action on the liver should especially be kept in mind; it should therefore be given with care and every precaution taken. I may say, however, that though I have used injections of phosphorated oil in only four cases of oriental sore, I have used this therapeutic method without any ill-effects in several other conditions, since I found, some years ago, that phosphorated oil given by subcutaneous injection was almost painless. I have used it, for instance, without any untoward effect in cases of rickets and of osteomalacia, and in certain cases of very chronic malarial cachexia as an adjuvant to quinine and arsenic.

Phosphorus is chemically closely related to antimony, and it is not improbable that it will be found useful in other diseases in which antimony has been used.

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JUNE 1, 1923.

THE SKIN: ITS LESIONS AND TREATMENT.

THE skin presents to the general practitioner a rather forbidding branch of medicine, for, anatomically, physiologically, pathologically, and therapeutically, it receives but scant attention. Clinic-

ally the terminology of skin ailments have a difficulty all their own, and except to the specialist is almost a closed door. Between the specialist and the general practitioner a barrier exists which shows little tendency to be surmounted, and in fact it appears with advancing years rather to increase. A smattering of knowledge is all that seems possible to acquire in general practice, for the details of microscopy seem interminable and the terminology interminable in its varieties.

The skin is attacked from without and from within, from without its enemies are many, involving the whole of the insect world; and from within the evils of the alimentary canal, the renal tract, and the nervous system each play a part. Excretion and absorption are constant factors in the physiology of the skin and its appendices. Climate, baths, and the idiosyncrasies of diet play a part in its pathology, so that a maze of complications have to be encountered without parallel in any other department of medicine. Not the least of these complications are the literature, the terminology, and nomenclature being totally outside that of any other branch of medicine.

Skin diseases in the tropics are an everlasting source of interest, a fruitful source of confusion, and often of error. These present so many technicalities in their clinical, pathological, and therapeutic relationship that most men are frightened to put pen to paper regarding them. In this way much information is lost, and no organ of the body suffers more than the skin from the ignorance—shall we call it—attached to the clinical terminology which haunts all to do with the ailments of the skin. It is but the other day that dermatology was admitted as one of the legitimate departments of our hospital clinics, and any man who took up skin was stigmatized as a "skin doctor," to which was attached a derogatory flavour and a tinge of quackery. Thanks to such men in this country as Wilson, Hutchison, Living, Tilbury Fox, and several others, who through good report and evil report, faced the slight implied the science of dermatology has emerged triumphant and now occupies a high place in the departments of medicine. As one reads the various papers in this issue of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, one is struck mostly by the number of ailments which are met with independently of bacteriological and parasitic infections, and are of a congenital, a neurotic, a digestive—in other words, of a functional origin.

The two initial papers by the master hand of Dr. R. G. Archibald, D.S.O., of Khartoum, describes two skin affections (a) lichen planus hypertrophicus, and (b) erythrodermia congenitale ichthyosiforme, each illustrated freely, and rare if not wholly unknown in the Soudan. Dr. R. W. Mendelson of Siam suggests a new name for that peculiar development hitherto known as "juxta articular nodules." The origin of these are ascribed to several causes. Some observers ascribe them to parasitic, some to fungi infection, and others to a

late manifestation of yaws. MacGregor suggests that these tumours are of mechanical origin, appearing most frequently or coming on the parts of the native's body which come in contact with the ground when he is asleep. Why the name xanthoma is now to be attached to the nodules it is a little difficult to understand. A yellow colour has not been attached hitherto to the nodules, for except in xanthoma diabeticorum, which sometimes has a yellow patch or spot on the top, the yellow colour is not spoken of. The name tropical is readily accounted for, as the ailment has so far been met with in the tropics and sub-tropical regions only. Dr. Mendelson's opinion is that the condition is a pathological metabolic process as yet undetermined. The growths are benign in character and removal by the knife the only remedy. The "yellowness" seems to be due to a stretched condition of the skin over the subcutaneous nodules in the later stages of development causing local anæmia.

Major Ferdinand Schmitter gives an interesting account of the terms *tinea flava* and *pitryiasis versicolor*, and enlarges upon the many variations which cultures on various media produce, and relates experiments to show that *tinea versicolor* is not the harmless skin lesion usually supposed.

Dermal leishmanoid, by U. N. Brahmachari of Calcutta, brings to light a new form of cutaneous leishmaniasis which occasionally develops in cases of kala-azar after antimonial treatment. Dr. Castellani and Henri Tejera give a note on the aetiology of "Cute," an affection characterized by the presence of bright yellow patches desquamating, if at all, to but a slight extent, and continues from childhood onwards. The examinations of scrapings from the yellow patches treated with liquor potassæ show presence of spore-like bodies, scanty in numbers, and a few mycelial particles. The symptoms of "cute" seem identical with the *tinea flava* described by Castellani.

Actidium castellanii (Pinoy), by R. Craik.

This fungus causes a peculiar ulcerative condition described by Castellani. Craik creates a new genus for it: *Pseudomicrosporon*.

Rhus dermatitis, *Rhus toxicodendron* (poison ivy), and *Rhus diversiloba* (poison oak).—The signs and symptoms of poison ivy are well known, but those of the poison oak are less definite perhaps from their being less carefully investigated. These infections may be carried by actual contact with the resinous sap, or it is suggested that it may be carried by soot, by clothing, croquet balls and shoes.

A Note on the Use of Flavine-Starch Poultices in Eczema.—It is suggested that seborrhæic eczema of head and groin have been benefited as follows:—

Four tablespoonfuls of rice starch and 10 gr. (0.6 grm.) of acritlavine are mixed with a little cold water, one pint of boiling water is added, and the mixture is boiled with constant stirring till it thickens. When nearly cold it is poured on to dressing cloth so as to form a layer half an inch

thick. When quite cold and set it is covered with a single layer of gauze or butter muslin, and applied to the part. It is changed three or four times a day, and at each change the part is bathed with acriflavine 1 in 1,000 in 0.85 per cent. NaCl. These applications should be continued until it is considered more stimulating remedies may safely be applied. Only two or three cases have been seen so far which did not respond readily to this method, and success has been achieved with it in several cases which had resisted other methods for weeks. Proflavine is less irritating, though rather less efficient, and could probably be employed up to 1 in 500 with benefit, but so far only acriflavine has been used.

Phytosis of the Feet, by M. B. Hutchings.

Cases reported from practically every part of the world almost demonstrate pandemicity.

Commonest foci of infection are public baths, especially showers, and family contamination of rugs and floors, and perhaps towels. Reinfection occurs from shoes, slippers and socks, even after laundering, or from laundry transference. The duration of viability of the fungi is from many months to an indefinite period, even in dry air. The majority of cases seems to indicate cold weather dormancy of organisms, even if the daily temperature reaches 60° F.

The resolve of the editors to publish an edition devoted to the skin and its treatment is a wise one, and its continuance will be welcomed.

J. C.

Annotations.

Injections of Trichophytin in the Treatment of Ringworm Infections (F. J. Novak, *Ceska Dermatologie*, vol. iii, No. 1, 1922).—Experiments have been made in a clinic at Prague with subcutaneous injections of trichophytin and trichon in the treatment of ringworm, in addition to the usual treatment (1 per cent. hot resorcin sol.). Used alone they are not sufficient to overcome the infection, but when used together in severe cases they tend to hasten the cure. Trichophytin is a product of the State Serological Institute, Vienna, and is a weaker preparation, which causes less pain and local reaction, and is useful for superficial cases of infection. Trichon is a polyvalent trichophytin made according to the formula of Professor Bruck by Schering in Berlin, and is used for deep cases.

Rhinoscleroma (V. Pardo-Castello, M.D., and M. Martinez Dominguez, M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 4, April, 1922).—The authors report the first case of rhinoscleroma that has occurred as far as they know in Havana, and it occurred in a person who had never been abroad.

The microscopic examination of the tissue proved it a typical granuloma, with the occurrence of

vacuolated cells of Mikulicz and plasma cells in hyaline degeneration, characteristic of rhinoscleroma. The bacteriologic study demonstrated the presence in the cells of a germ, which was recovered from the cells in pure cultures, and which, from its biologic characteristics, belonged to the group of *Bacillus lactis aerogenes*. Cultures of this germ produced an intense febrile reaction and inflammation when injected into guinea-pigs, but failed to reproduce rhinoscleroma.

The germ which was found in a case, clinically and pathologically of rhinoscleroma, did not resemble at all the bacillus described by Frisch as the etiologic agent of this disease.

Dermatitis caused by Megalopyge opercularis, a Texan Caterpillar (Nathan C. Foot, *Journal of Experimental Medicine*, vol. xxxv, No. 5, May, 1922).—The dermatitis caused by contact with the larva of *Megalopyge opercularis* is produced by a poison introduced by the hollow, specialized setæ of its cuticular tubercles. It is not produced by the ornamental hairs or by the tissue juices of the animal.

The poison appears to be of the nature of a venom, combined with protein vehicles, and may be itself a protein. It is rendered inert by boiling, or by heating to 55° C. for a considerable period of time.

It is apparently stored in sacs at the base of the setæ, but whether secreted there, or by hypodermal glands, remains to be determined. It diminished in virulence after the larva has spun its cocoon, and is no longer active after the caterpillar is dead.

The poisonous spines cause localized necrosis of the human epidermis, followed by the formation of small vesicles. The cellular reaction to the poison is chiefly lymphocytic.

Treatment of Psoriasis by means of the Extracts of Endocrine Glands (J. Camrda, *Ceska Dermatologie*, vol. iii, No. 21, 1922).—The author describes a case of psoriasis which occurred in a boy of 10, and which had resisted treatment for six years. A course of thymus extract was started, and when this was finished thyroid and testes were substituted, with the result that after two months all signs of the psoriasis had disappeared.

Intramuscular Injection of Turpentine in the Treatment of Diseases of the Skin (Oscar Levin and Emil Rose, *Archives of Dermatology and Syphilology*, vol. vi, No. 5, November, 1922).—The authors strongly recommend the use of turpentine injections in the treatment of a large number of skin diseases. It may be of real value in the pyogenic infections, especially when there is follicular involvement. In such instances the injections may be given in conjunction with the local application of the Röntgen rays. Good results

were observed in tinea barbae. Further observations should be made for the abortion of pityriasis rosea. In old ulcers the administration of turpentine was followed by evidence of stimulation and a tendency to healing. Fair results were obtained in acne indurata. A dose from 0.5 to 1 c.c. of a 15 per cent. solution of rectified turpentine in sterile olive oil injected intramuscularly causes no pain and gives the best result. The effect is both local and general. Locally there is apparently cell irritation, while the vital centres in the medulla oblongata are reflexly stimulated.

The Causes of the Appearance of Blue Spots on the Human Body (E. Pawlowsky and A. Stein, *Bulletins de la Société de Pathologie Exotique*, July 12, 1922, tome xv, No. 7).—It has long been well known that, following on the bites of *Phthirus pubis*, blue spots appear on the skin of the human body, but until now the real cause of their appearance has not been made altogether clear. Numerous experiments have been carried out to find out this real cause, but the only conclusion arrived at so far is that the blue spots are effectively provoked by morpions and do not show the symptoms of any diseases, infectious or otherwise.

In order to ascertain whether it is the saliva or a product of regurgitation of the digestive tube which produces the blue spots, the authors experimented with extracts of the salivary glands and of the stomach of the *P. inguinalis*.

Eight experiments with the extract of the salivary glands gave positive results. Negative results were obtained on trying to inject an extract of the stomach of the *Phthirus*.

Thus the blue spots appear to be the result of the penetration of the saliva of the *P. inguinalis*, or the extract of its salivary glands into the human organism.

Potassium Permanganate as a Curative Agent in Dermatologic Diseases (Samuel Feldman and Benjamin F. Ochs, *Archives of Dermatology and Syphilology*, vol. vi, No. 2, August, 1922).—Potassium permanganate has, in the opinion of the authors, yielded better results in the treatment of epidermophytosis than any drug or combination of drugs hitherto employed. It can be used in strengths ranging from 1 in 5,000 to the full saturated solution, the former in early, moist and irritated lesions, the latter in those associated with deep infiltration and lichenification.

Cases of intertrigo of the mammary folds and on the upper thighs yield readily to very dilute solutions (1 in 5,000), while in the intertrigenous type of epidermophytosis occurring between the fingers and toes stronger solutions may be employed with equally good results.

Unmistakable results are obtained in eczema marginatum by wet dressings and, in old lesions, by paintings with strong solutions of the drug.

Patches situated on the flat surface of the body are occasionally resistant to treatment.

In eczematoid ringworm, far better results are obtained by this method of treatment than is seen with the use of Whitfield's ointment. These cases require a longer period of treatment in order to obtain a cure than those enumerated in the foregoing, and the treatment must be kept up a long time after the disappearance of the lesions in order to make the results permanent.

The dyshydrotic form is the most resistant to treatment, especially in the presence of deep-seated vesicles and a thickened epidermis. Even here good results are obtained after the lesions are prepared by some keratolytic agent.

The Transmission of Dermal Leishmaniasis in Mexico (A. Inchaustegui, *Thèse Mexico*, 1918).—The author describes the occurrence of leishmaniasis among gum gatherers in Mexico. He thinks that the cause must be an insect that frequents the forests, and that it must be capable of flying, as the common localization of the disease is on the ear. The disease is very widespread, in certain localities there being an incidence of 50 per cent. of the population. Intravenous injections of tartar emetic with local applications are recommended as the best form of treatment.

Eosinophilia and its Relation to Skin Diseases (V. Svestka, *Ceska Dermatologie*, Nos. 3-4, 1919).

—The author reviews theories of the origin of eosinophilia from the bone-marrow and the possible transformation of neutrophils into eosinophiles. He believes in the possibility of extramedullary origin or eosinophiles and in local histogenesis of eosinophilic cells in the skin and mucous membranes. Ten cases of scabies were studied in regard to blood changes. In the untreated cases a very high degree of eosinophilia was present, while the number of cells decreased rapidly after treatment. Eosinophilia is the result of irritation of the organism by toxic products of the vital activity of parasites, it increases in proportion to their activity, and is independent of skin findings.

Histological and Experimental Study of Aleppo Boil (J. Kyrle and J. Reenstierna, *Acta Dermatovenereologica*, vol. i, No. 1, 1921).—Experiments were carried out inoculating scrapings from Aleppo boil in monkeys and dogs through five generations, with the result that the period of incubation was reduced in the case of monkeys from four months to five weeks. Examination showed the lupoid appearance to be a late occurrence at the time of the observed disappearance of the organisms from the tissues. Re-inoculation experiments tended to show that the animals had developed a condition by hypersensitivity.

Phlebotomus as Transmitter of Dermal Leishmaniasis (A. de C. Cerqueira, *Saude*, Rio-de-Janeiro, 1919, vol. ii, p. 22).—The author describes a case of oriental sore probably conveyed by phlebotomus, as it occurred at the exact point of puncture of one of these flies. Four other cases have been reported which are almost identical. The biting Psychodid of South America is known as *Phlebotomus lutzi*.

Results of Hetero-vaccine Therapy in certain Skin Affections and Syphilis (Capelli and Signorelli, *Giorn. Ital. d. Mal. Ven. e della Pelle*, vol. ii, p. 181, 1920).—In several cases of skin diseases and syphilis a cholera vaccine was made by Loeffler's method, and, together with physiological salt solution, was injected into a vein. Only one injection was given in each case, followed by a rigor in about thirty minutes, temperature rising to 38.5° and 39.5° C., falling to normal again in about six hours. In a case of *Pemphigus vegetans* the lesions showed a definite diminution for several days, a slight recurrence of the eruption occurring later. In two cases of pustular eczema the inflammation and suppuration diminished, but an attack of influenza caused a return of the former condition. In four cases of syphilis, mucous patches disappeared from the first, but there was no effect on the lichenoid eruption. In the second oral and perianal moist patches cleared up completely; in a third the erythematous rash was accentuated, but partial resolution of moist patches was observed; and in the fourth case, which was a pustular syphilide, the eruption slightly increased at first, but marked improvement set in later.

A Case of Generalized Sclerodermia with Recovery (Luigi Bussolai, *Giorn. Ital. d. Mal. Ven. e della Pelle*, vol. vi, 1921). The author describes a case of pleurisy with effusion which occurred in a boy, 10 years of age. During the illness an acute sclerodermia developed, starting in the neck and spreading to the face, limbs and body, producing the usual rather oedematous stiffness. On excision the skin showed oedema of the connective tissue with some connective tissue proliferation. The treatment consisted of iodides and arsenic internally, and massage and hot-air baths locally, the result being completely successful.

Experiments on Alastrim (James P. Leake and John N. Force, *United States Public Health Reports*, vol. xxxvi, No. 25, June, 1921).—A vesico-papular eruption was produced in monkeys by inoculation both with crusts and with vesicle contents from alastrim patients. The animals were protected against reinoculation with alastrim and vaccine virus. Rabbits inoculated with alastrim showed no eruption, but were almost completely immune to vaccine virus. Rabbits previously inoculated with vaccine virus gave positive intra-

cutaneous reactions to smallpox crusts, alastrim material and vaccine virus, but remained negative to chicken-pox crusts.

The fact that definite immunity to vaccinia is produced by previous inoculation with alastrim is additional evidence of the essential identity of alastrim with smallpox.

Frequency of Seborrhœa among Algerian Mussulmans (Jean Montpelliér, *Bull. Soc. Française de Dermat. et Syph.*, June, 1919).—The author points out that the alopecia which is usually ascribed to seborrhœa is very rarely found in the natives, while in Europeans it is nearly always present. On the other hand, acne psoriasisiform parakeratoses and eczematization usually associated with seborrhœa are found in natives as well as Europeans.

Unusually Severe Effects of Bee Sting (South African Medical Record, March 26, 1921).—Mr. Fitzsimmons, the Curator of the Port Elizabeth Museum, and a great authority on animal poisons, favours the Editor of the *South African Medical Record* (March 26, 1921) with the following extract from a letter in which a lady describes her symptoms when stung by a bee: "I live in a place where bees are plentiful. I have been stung several times, and each time the sting affects me worse. Recently a bee stung me on the thumb through my glove, and five minutes afterwards my whole body, from head to foot, was covered with a rash, and I was swollen all over and felt dreadfully ill. The soles of my feet pained me very much, and I could neither walk nor sit up. I felt faint and everything turned black in front of my eyes, and I had terrible pain in the abdomen, and was shaking so much that I could not hold a glass, much like a bad attack of ague. This lasted for about three hours, the swelling gradually getting worse. After that the pains got better, and I became able to see clearly, but then breathing became difficult, and I felt as if I was going to choke, and that my throat and chest were closing. During breathing there was a funny noise in my chest. This lasted for about three hours. I always have a very bad cold after these attacks. It is now four days since I was stung, and I do not feel myself yet."

Streptococcic Dermatoses (E. D. Chipman, M.D., *Archives of Dermatology and Syphilology*, vol. iv, No. 4, October, 1921).—Unna has maintained that different strains of streptococci may one day be demonstrated in the production of various forms of impetigo. Certainly it would not appear far-fetched to reason that, just as different strains of streptococci have been isolated in scarlatina, erysipelas and measles, so they may be isolated in impetigo, ecthyma, intertrigo and other dermatoses.

The character of the soil and certain internal influences may account for some objective differ-

ences in lesions due primarily to streptococci. What seems probably the determining factor of most importance is the variation in the organism itself.

Impetigo, ecthyma, intertrigo and perleche are matters of such common agreement that no comment is needed. Impetiginization is a diffuse form of impetigo secondarily affecting an antecedent dermatosis which retains its own individuality. Infectious eczematoid dermatitis denotes the eczematization of an infection, the infection preserving its own character in spite of the complication. Chronic forms of impetigo are frequent. They present such lesions as circumscribed plaques of pityriasis, as well as impetiginous processes behind the ears, on the scalp, and about the nose and eyes.

Notes on Oriental Sore in Russian Turkestan and the Results of Treatment with Injections of Tartar Emetic Solution (J. A. Sinton, M.D., Major I.M.S., *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 2, 1921).—This disease is very widely spread in Russian Turkestan, and is said to be found in all the towns on the Trans-Caspian Railway from Askhabad to Tashkent. Yakimoff and Schockov (1915) described it at Askhabad, Boukhara, Samarkand and Termeze, and in the latter place it seemed especially prevalent. Locally it is said that practically every person residing in Turkestan for five years has the marks of at least one of these sores. At Tedjen station, on causal inspection, about 50 per cent. of the people seemed to have marks of old sores on their faces, but the authors stated above say that only 58.2 per cent. of the sores examined were leishmaniasis. The same authors report two cases of cutaneous leishmaniasis in dogs in Turkestan.

In all the six cases noted by the author *Leishmania tropica* were found. The treatment used was intravenous injections of 2 per cent. solution of antimonium tartaratum (tartar emetic) in normal saline solution; the sores received no special local treatment. Except for a little vomiting immediately after the injection, in two cases no constitutional effects were caused by the injections.

A New Case of Creeping Disease in Russia (E. N. Pawlowsky and A. R. Stein, *Bulletins de la Société de Pathologie Exotique*, tome xv, No. 7).—Literature affords a considerable number of recorded cases of creeping disease in different regions. These are treated from varying points of view. The present one, which the authors describe in this article, was observed by means of a minute analysis of a small piece of skin excised together with the parasite which it enclosed.

Industrial Dermatitis at the Massachusetts General Hospital (C. Guy Lane, *Archives of Dermatology and Syphilology*, vol. vi, No. 5,

November, 1922).—Seven per cent. of dermatitis and venenata and eczema, or almost 3 per cent. of all admissions to a skin clinic in a large hospital, were occupational in origin.

It is fair to estimate that 4 or 5 per cent. of admissions to a skin clinic may be occupational.

A more careful study should be made of the individual patient.

A more exact study of trade processes should be instigated in case of questionable eruptions on exposed surfaces.

The consideration of preventive measures should be a greater factor than is seen in the cases at the clinic.

Some name, such as "dermatitis industrialis," or at least a more accurate place in our nomenclature, should be provided for this definite etiologic group of cases.

The Application of Cutaneous Sensitization to Diseases of the Skin (M. F. Engman and W. G. Wander, *Arch. of Derm. and Syph.*, 1921).—The authors deal with the relative cutaneous reactions to various proteins of certain diseases, such as urticaria, erythema multiforme, eczema, pemphigus, &c. A careful history was taken in each case to discover whether there was any apparent relation to food, such as an exacerbation following the ingestion of a certain food; if the history was negative such food proteins were tested as milk, egg, wheat, beef, &c., and a variety of bacterial proteins. All the tests were performed on the inner surface of the forearm.

The results showed that in chronic generalized eczema 38 per cent. showed a positive sensitization; in infantile eczema, 78 per cent.; in urticaria, 79 per cent.; while in cases of dermatitis herpetiformis, lichen urticatus and pemphigus the percentage was negligible.

Skin Colour in Malaria (*La Tinta dei Malarici*) (Jona, *Policlinico Sez. Prat.*, vol. xxviii, July 18, 1921).—There is nothing specific in the colour of the skin in malaria, which, in most cases, is due to a profound secondary anemia. It is earthy-yellow, earthy-grey, waxy-white, according as the patient's skin is naturally yellow, brown or white. Sometimes it is subicteric, the jaundice being usually between hemolytic and retention. Malarial pigment is not fixed in the skin. Malarial melanoderma is a possibility, but is very exceptional.

A Malarial Rash (*Das Malariaexanthem im Klinischen und Pathologisch-anatomischen Bilde*) (Bauer and Frenkel, *Arch. f. Schiffs- u. Trop.-Hyg.*, vol. xxv, No. 12, 1921).—A patient was admitted to hospital with a petechial rash on the outer side of the arms, on the gluteal region, and, less extensively, on the forearms. He had rigors, and an

examination of blood showed benign tertian parasites. Excision of two of the petechiæ showed extravasation of blood with cellular exudate, and thrombi becoming organized within the vessels. These thrombi showed plasmodia. There was no history of previous malaria, so that the condition could not be due to quinine, since none had been taken, but is attributed to the malarial virus, though this is not in agreement with Muhlén's theory that "malarial exanthem" has never been proved to be the result of malaria.

A Serological Investigation of Oriental Sore (McKinstry, *Brit. Med. Journ.*, February 4, 1922, and *Journ. Roy. Army Med. Corps*, vol. xxxviii, No. 3, March, 1922).—In order to test the Wassermann reaction in oriental sore, twenty-eight cases, in all stages of the disease, were tested by the author by the technique in use at the Military Hospital, Rochester Row. Only one positive Wassermann reaction was obtained, and that from a case suffering from concomitant syphilis. The presence of the parasite established the diagnosis in all cases except one.

Cutaneous Leishmaniasis (Caliceti, *L'Oto-Rhino-Laryngologie Internationale*, December, 1920. Summarized in *Brit. Med. Journ.*, January 11, 1922).—In two cases of Sicilian oriental sore, each of which had lesions of the ear and nose, cure was obtained in three weeks by two injections in each case of emetine hydrochloride. The blood in both cases contained antibodies, and an antigen extracted from the spleen of a kala-azar case was used to obtain deviation of the complement. Antigen employed in the Wassermann test produced no reaction.

Two Rare Forms of Cutaneous Leishmaniasis: Leishmanial Lymphangitis simulating Sporotrichosis, Malignant Leishmaniasis, in Three-year-old Child (Duos Formas Raras de Leishmaniose Tegumentar—Lymphangite Leishmaniosica Simulando a Espero—Trichose; Leishmaniose Maligna numa Criança de 3 Anos (De Aguiar Pupo (João))).—Two cases of cutaneous leishmaniasis, seen in Brazil, are described.

Case 1.—Remarkably extensive involvement of the lymphatics of the leg in a man of 47 years. The lymphatic running up the leg became infected from a primary lesion which occurred above the ankle. A row of large ulcers, in which leishmania were shown, were produced from a series of nodules which had developed between the primary lesion and the knee.

Case 2.—Numerous ulcers about the face, arms and legs, and involvement of the nasal mucosa, were observed in a child of 3 years old.

In Case 1 tartar emetic produced excellent results, and in Case 2 all the sores were healed,

except the mucosal ulcers of the nose, with disodoluargol. Anthelmintic treatment directed against a concomitant ankylostome infection produced great improvement in the mucosal ulcers of the nose.

Auricular Mange in Domestic Animals (Veneendaal, *Tijdschrift voor Veeartsenijkunde*, April 1, 1922).—The author gives a general account of auricular mange in cats and dogs. The Sarcopite mite that causes it is found in the external meatus and on the internal surface of the ear. Volatile and strong-smelling substances, such as ethereal oils, are most effective as antiparasites. In liquid paraffin the parasite can live five days; it can also live and feed at 86°-90° F. Reduction of temperature produces torpor in the parasite. The most successful treatment of the disease is by swabbing with 1 per cent. solution of carbolic acid in glycerine. An alcoholic solution of resorcin (3 per cent.) is used for the treatment of otitis.

Experimental Study of a Pathogenic Acid-fast Actinomyces (Nocardia) (D. J. Davis and Onfre Garcia, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923).—The actinomyces here described was isolated from a human case. It is acid-fast and pathogenic for animals. It belongs to the general group of *Nocardia*.

The extracted organism is practically Gram-negative and non-acid-fast. The extracted fatty substance is acid-fast and Gram-positive.

The organism is pathogenic to rabbits, rats and guinea-pigs and mice. Intravenous injection into rabbits produces typical tubercles in the lungs and other organs containing characteristic ray-like bodies.

The organism may show striking conidia-like forms in liquid mediums which may be of value in identification.

The antiforin method must be avoided in a suspected case of acid-fast actinomyces (*Nocardia*).

A Brief for the more accurate Classification of Industrial Skin Disease (C. Guy Lane, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923).—The adoption of the term "Dermatosis industrialis" in the diagnosis of pathologic skin conditions from industrial causes is urged, to be employed in conjunction with two qualifying terms, one signifying the type of eruption and the other the causative element, if known, or the occupation if the exact cause is not known.

Infantile Eczema and Examination of the Stools (Charles J. White, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923).—Proper use of crude coal tar paste, properly prepared, with the most conscientious regard to proper

general precautions will cure, and cure promptly, the great majority of cases of infantile eczema treated in private practice.

The number of failures to cure promptly under the foregoing conditions during the last four years and more have been relatively small—so small that the ensuing deductions may be unfortunately and of necessity comparatively valueless.

Dermatitis Venuata (C. Pardo-Bastello, *Archives of Dermatology and Syphilology*, vol. vii, No. 1, January, 1923). There are more than forty species of plants in the Antilles that produce skin reactions, varying from erythema and pruritus to severe bullous dermatitis, with serious general disturbance.

These dermatitides are produced by the latex of the plants or by their appendages, generally the hairs. The latex of *Comocladia dentata* contains a very irritant oil. A substance of glucosidal nature has been isolated from *Hippomane mancinella*. The hairs of the other plants studied act not only mechanically, but also chemically, owing to the existence of an irritating acid oil.

The ingestion of certain parts of the plant—the fruit in the case of *C. dentata*—seems to produce immunity.

The hairs of the different plants studied have differential characteristics which may prove of importance for the diagnosis of the offending plant, especially in cases in which the cutaneous reaction is so similar that, unless the hairs found on the skin are examined, the diagnosis is impossible.

Creeping Myiasis due to Gastrophilus (E. N. Pavlovsky and Stein, *Bulletin de la Société de Pathologie Exotique*, July 12, 1922).—Many cases have already been recorded of creeping myiasis due to larva of *Gastrophilus*. The case which the author here reports in man is peculiar in that the larva, instead of being found in the external layer of the epidermis, had burrowed into the Malpighian layer.

Inoculation, Auto-inoculation and Complement-fixation Tests in Pompholyx (Sigmund S. Greenbaum, *Archives of Dermatology and Syphilology*, vol. vi, No. 6, December, 1922).—Pompholyx is a clinical entity whose cause remains unknown. When well defined, ringworm as the etiologic factor can be clinically excluded.

There are poorly-defined or aborted cases of pompholyx whose differentiation from the pompholyx-like lesions of ringworm require microscopic and cultural examinations. Auto-inoculation, as a diagnostic test, is of value, but great care in the collection of the material to be used is advised, as severe scarring from secondary coccic infection may occur.

There are pompholyx-like eruptions having a mycotic origin.

Experimental Production of Paraffin Oil Tumours in Monkeys (Fred D. Weidman and Marjorie S. Jefferies, *Archives of Dermatology and Syphilology*, vol. vii, No. 2, February, 1923).—Although the subject is but 5 or 6 years old, it has now been shown beyond a doubt that the subcutaneous or intramuscular injection of paraffin oil as a vehicle is attended with the danger of subsequent tumour formation. Tumour formation is not dependent on the technique of the injection, but probably on individual predisposition.

To protect the patient and himself, the physician should insist that, if the proprietary preparation is used, it shall be specified that no mineral oil is employed as the vehicle.

Clinically, it has been found that the tumours undergo metastasis toward lymph nodes, or even extend distally—"retrograde metastasis." Under these circumstances they simulate tuberculosis or malignant tumour. The tumours have substantially the same histologic characters as the better known paraffinomas.

It has been shown, experimentally, on monkeys, that paraffin oil will produce tumours at the site of injection by inducing a foreign body granuloma (twelve "takes" in sixteen injection points). The oil may then be transported by lymphatic channels to regional lymph nodes and be there deposited. They do not always induce granulomas en route, nor did they ever induce inflammatory reaction in the lymph nodes. Olive and cottonseed oil appear, contrariwise, to be innocuous.

To the well-known oil embolism of the blood circulatory system, the general pathologist should now add that of the lymph vascular system.

Treatment of Chronic Eczema with Concentrated Carbon Arc Light (Finsen) (Svend Lomholt, O.B.E., M.D., *Brit. Journ. of Dermatology and Syphilis*, February, 1923).—In the Finsen Institute at Copenhagen the application of concentrated light from a carbon arc lamp has given very satisfactory results in nearly 100 cases of chronic eczema. In this treatment the ordinary single exposure for each spot to be treated was seventy to one hundred and forty minutes daily of a carbon arc light of 50 amperes and 55 volts; the exposure must be varied in proportion to the thickness of the skin in question. The treatment has many advantages over X-rays, besides a certain stimulating effect upon the skin, but unfortunately cannot be recommended for all cases of eczema, being somewhat laborious and expensive. It should be limited to such cases as remain uninfluenced by ordinary methods of treatment.

Clinical Commentary on Studies of Histologic Changes in Organs induced by Arspheamin, by Neo-arspheamin, and by Mercury (J. F. Sehamberg, *Archives of Dermatology and Syphilology*, April, 1921).—The author is of the opinion that

vigorous mercurial treatment is often responsible for arsenical intoxication when arsphenamin and mercury are used at the same time. Large doses of both ought not to be employed synchronously. When the two are used jointly their respective doses should be inversely proportional to each other. It would appear best to give the courses of mercury subsequent to that of arsenic.

Abstracts and Reprints.

LUPUS LEISHMANIASIS: A LEISHMANIASIS OF THE SKIN RESEMBLING LUPUS VULGARIS: HITHERTO UNCLASSIFIED.¹

By J. B. CHRISTOPHERSON, C.B.E., M.D., F.R.C.P., F.R.C.S.

FIG. 1 shows an Oriental sore which may be regarded as typical—a single ulcer on an exposed surface of the body, manifesting itself as a papule, whose summit necroses, leaving an indolent ulcer, with irregular thickened edges, sloughy surface and granulating base, reaching the size of a sixpenny or a shilling piece. Later, as a result of an attempt at healing, the margins become shelving; the chronicity of the ulcer is indicated by a characteristic pigmentation of the skin around, which has an indigo-blue appearance. There is no enlargement of the nearest lymphatic glands.

Typical Oriental sore is not easily mistaken. Diagnosis is confirmed by finding the Leishman-Donovan body in a scraping from the ulcer. The ulcer may become multiple by auto-inoculation, but the resulting sores are of the same character as the original.

In the Near East Oriental sore heals spontaneously in about a year, but in England it does not appear to have a tendency to heal without treatment. Other clinical varieties of dermal leishmaniasis have been described besides this typical form:—

(1) Ferguson and Richards in Cairo described a *rerrucose* form.

(2) Cambillet and others have described a *keloid* form.

(3) A *papillomatous* form has also been described. These forms are nodular and non-ulcerating, but the nodules are like solid warts, and they do not resemble lupus vulgaris.

A *frambesiform* variety resembling yaws, consisting of ulcers capped with yellow crusts, is said to be common in the West Indies.

The form which I record differs from all these previously recorded varieties. The photograph, fig. 2, illustrates it. I have lately seen two similar cases, both nursing sisters, and both from Bagdad. In both the lupus-like eruption on the face followed an Oriental sore which was thought to be "cured."

History.—The history of the case is as follows: Arriving at Bagdad in March, 1920, the nurse was bitten on the cheek by an insect in September of the same year. The cheek swelled but subsided in a few days. A small puncture marked the place for three months.

In December, 1920, when she was invalided home (for tachycardia), the bite was still a small puncture, with a little dry scale. At Bombay, whilst on her way home, Leishman-Donovan bodies were examined for with negative result.

In February, 1921, when at Netley, Leishman-Donovan bodies were found, and the diagnosis of Oriental sore made. This was five months after the insect-bite. Fomentations and methylene-blue ointment were applied.

At the end of April, 1921, Leishman-Donovan bodies were again found at Millbank, where she had been transferred. Antimony ointment and boracic ointment were applied, and the sore was given one exposure to the X-rays.

About the middle of June, 1921, Leishman-Donovan bodies ceased to be found, and she was discharged from hospital apparently cured. Treatment had extended over four months. The original sore had lasted nine months. It was now healed.

In November, 1921 (five months after *apparent cure*), a "tiny raised lump," which had remained, "seemed to grow larger, and other lumps appeared one by one" around the original scar.

On June 9, 1922, twelve months after the apparent cure of the original Oriental sore, the nurse came before a Pension Board at Cheltenham Terrace. The appearance then was as shown in fig. 2.

There were about twenty-three small, very soft, discrete nodules of a yellowish-brown, "apple-jelly" colour, which, when pinched up between finger and thumb, were quite impalpable and devoid of induration. Diascopy showed the yellow staining usually described as characteristic for lupus vulgaris. The covering skin was thin but normal, not ulcerated nor broken. A scar marked the site of the original Oriental sore. The nodules were arranged round the scar but not in it. They spread nose-wards rather than ear-wards. There was no pigmentation, and no enlargement of the nearest lymphatic glands. Neither pain nor irritation was complained of. A series of photographs was taken to record the progress under treatment.

Treatment.—The effect of treatment is shown when fig. 2 is compared with fig. 3. This effect was produced in six weeks, and would seem finally to negative the diagnosis of lupus vulgaris.

Intravenous injections of antimony tartrate were commenced on June 12, 1922, and were given three times a week; the commencing dose was $\frac{1}{2}$ gr., increasing by $\frac{1}{2}$ gr. each injection until 2 gr. per dose were reached, and 2 gr. were continued until 30 gr. (total) had been given.

Although the nodules as such had disappeared, and the *niveau* of the affected area was on a level

¹ Abstracted from the *British Journal of Dermatology and Syphilis*, vol. xxxv, April, 1923, pp. 123-131.

with the surrounding skin, there was still a dirty brownish-yellow staining where the nodules had been, and "blue bodies" were still found in the scraping, suggesting that leishmania infection still was present. After the nurse had been home for six weeks she returned and had a further course of 16½ gr. Another interval at home was followed by another course of 17½ gr., making a total of 64 gr., and there only remained a very faint yellow stain, scarcely noticeable. The whole course of treatment, including the two intervals of eight weeks and seven weeks, lasted thirty-three weeks.¹

In spite of the tachycardia she took the antimony well, and beyond an occasional headache and a little sickness and colic, and considerable muscular



FIG. 1—A typical case of dermal leishmaniasis (Oriental sore).



FIG. 2.—Lupus leishmaniasis. A soft yellow nodular non-ulcerating lesion. (The surface of each nodule is quite smooth—the photograph makes them appear rough.)



FIG. 3. The same patient as fig. 2 after a course of sod. antimony tartrate intravenous injections. The dark stains are discoloured areas which quite disappeared later. The thin white scar marks the place of the original Oriental sore.

pain after the injections, there were no complications, and there were no injurious results.

Pathology—In the case under review Leishman-Donovan bodies were found only once in a scraping, after June, 1922, and they appeared to be disorganized. "Blue-bodies," which I regard as of great value in the diagnosis of leishmaniasis, were, however, constantly present in this lupus form of leishmaniasis. Leishman-Donovan bodies are not always demonstrable in undoubted leishmania, just as in syphilis the *Spirochæta pallida* cannot always be found. We do not know what is the fate of the

¹When the treatment commenced in June, 1922, the eruption had been present seven months, and showed no signs of healing. J. B. C.

Leishman-Donovan body, in the body; it may be that under certain conditions it changes into "granule" form, and as such was present in the nodules (see later). The fact that the eruption followed a typical Oriental sore, and that it healed rapidly when intravenous antimony tartrate was given, is substantial evidence for the diagnosis of leishmania and negatives the diagnosis of lupus vulgaris.

It may be said that in order to establish the diagnosis a biopsy should have been done. Apart from the fact that the lesion was on the nurse's face, and she was naturally averse to having a section made, a stained section would not have been decisive. Both lupus and dermal leishmaniasis show giant-cell systems, and the one would not necessarily show the tubercle bacillus, and the other would probably not show the Leishman-Donovan body. The complement-fixation test for tubercle was done twice with doubtful positive result, and therefore did not help, but lupus vulgaris will not clear up in a few weeks with antimony tartrate as this eruption did.

I believe that I am recording a modified form of leishmaniasis, perhaps a residual condition, in which the virus of leishmania is not present as the Leishman-Donovan bodies, but which is a leishmania notwithstanding, and for which I would suggest the name of "lupus leishmaniasis."

The clinical condition here described has some resemblance to cases recorded by Brahmachari as "leishmanoid." In the *India Med. Gazette*, April, 1922, he records four cases of kala-azar, all of which had been treated and cured by antimony tartrate (intravenous), which within six months to two years after completion of treatment developed a cutaneous eruption on face and body resembling nodular leprosy. In his cases scrapings contained Leishman-Donovan bodies. Brahmachari thought they were analogous to varioloid (smallpox modified by vaccination). The illustration of one of Brahmachari's cases does not suggest, however, lupus vulgaris. They point to the fact that a cutaneous rash sometimes occurs in cases of kala-azar after "cure," but they do not indicate that cutaneous and internal leishmaniasis are caused by the same identical organism, as he suggests.

The cases which I record point to the fact that there is a form of leishmania clinically resembling lupus vulgaris, which appears to occur after the original sore has been "cured" either around the site of the sore or at some distant area.

Treatment of dermal leishmaniasis.—Oriental sore is not a local disease. This is shown by one of the lupus-like cases I saw, where the original Oriental sore occurred on the right arm and the lupoid eruption on the right cheek.

There can be no question that constitutional treatment by intravenous injections offers the most rapid and the surest method of cure for Oriental sore. Compared with intravenous antimony tartrate, X-rays, carbon dioxide snow, antimony ointment and local remedies are of little value. Local applications which seem to do good, such as

lysol, Loeffler's alkaline methylene blue, caustic potash stick, benefit because of their alkalinity. The Leishman-Donovan body abhors alkalinity, and alkaline applications are temporarily useful as a local measure. The parasiticial properties of methylene blue are much overstated.

The danger of giving antimony tartrate intravenously has been exaggerated. I have never seen a case of fatty degeneration of the internal organs. It is surprising what large doses are tolerated by the intravenous method. It is a matter of fact that the blood-vessels and the blood constitute an organ which can withstand ill-usage as well as, or better than, any other organ. Almost any clear sterile fluid may be injected, provided it does not break up the corpuscles or irritate the lining of the veins. The blood, as is well known, is able to deal with a certain number of living organisms if, inadvertently, they should be injected.

It would appear that in patients treated with intravenous antimony, when several courses are given, at intervals, each course is tolerated better than the former, but as each course proceeds the individual doses were less well tolerated, owing no doubt to a cumulative action. This is shown in minor symptoms, such as muscular pains, tendency to sickness, colic, headache, anorexia, &c.

BRIEF NOTES ON *EPIDERMOPHYTON RUBRUM*, CASTELLANI, 1909 (*TRICHOPHYTON PURPUREUM*, BANG 1910) AND *TRICHOPHYTON VIOLACEUM* VAR. *DECALVANS*, CASTELLANI, 1913, WITH REMARKS ON "ECZEMA MARGINATUM" ("TINEA CRURIS SEU INGUINALIS") IN JAPAN AND "LA LI TOU" OR "PARASITIC FOLLICULITIS" ("TINEA DECALVANS" *PRO PARTE*) OF SOUTHERN CHINA.¹

By Professor M. Ota, M.D.,

Formerly Director of the Dermatological Clinic, Medical School, Manchuria.

I.

In Japan and Manchuria the usual type of "eczema marginatum" (tinea cruris, tinea inguinalis) caused by *Epidermophyton cruris*, Castellani (*E. inguinalis*, Sabouraud) is much less frequently met with than the type caused by *E. rubrum*, Castellani. *E. rubrum* is a fungus very common in Japan and Manchuria, but it has often been confused by some Japanese dermatologists with *Trichophyton acuminatum* and even *E. cruris*. It is the commonest organism found not only in eczema marginatum, but also in so-called dysidrotic eczema, interdigital dermatitis and onychoc-

¹ Reprinted by permission of the *British Journal of Dermatology and Syphilis*.

mycosis. Dr. R. S. Hodges, University of Alabama, suggested that my three cultures of fungus brought from Japan were the same as his *Trichophyton* "A," viz., *E. rubrum*. I have further studied my strains in the laboratory of Dr. Weidman, University of Pennsylvania, and I have come to the conclusion that my strains were certainly *E. rubrum*, Castellani.

The cultures were isolated from cases of eczema marginatum, onychomycosis and dermatitis interdigitalis. The appearance of the cultures was identical with the descriptions given by Castellani, Bang and Hodges. Mycologically this fungus is characterized by the conidiophore hyphae bearing lateral pyriform spores, which are grouped in bunches, by the presence of multi-septated "fuseaux" (spindle-bodies), and at times rosary-like mycelial filaments composed of short thick elements. Attempts to infect guinea-pigs with this fungus were not successful; but I could observe that the hair-follicles were attacked by the spores and mycelia, though abortively; neither mycelia nor spores, however, could be seen in the hair itself. A more detailed description of the fungus will be found in other publications of mine in Japanese and American medical journals.

II.

The traveller in Southern China will be surprised to see what a very large number of natives are affected with baldness. The Chinese use the term "la li tou" to indicate baldness in general, but principally the types of parasitic origin.

In the famous Chinese medical book, "Bin-yuan-hou-lun" (605-609 A.D.) three varieties of alopecia are distinguished, namely:—

The white alopecia.

The red alopecia.

The demon-like alopecia (perhaps alopecia areata).

In modern medical works very little can be found on the parasitic alopecias of the tropics and the Far East, with the exception of Castellani and Chalmers' "Manual of Tropical Medicine" and Jeffrey and Maxwell's "Diseases of China." Castellani, some years ago, in various publications, put on record several types of baldness met with in the tropics, and described a peculiar type of parasitic origin, which he called "tinea decalvans." According to his description the condition is characterized by the scalp presenting at first one or several patches covered with an enormous number of heaped-up white scales (figs. 1 and 2). The scales and the broken hairs contain an endoectothrix fungus which, when cultivated, shows many characteristics of *T. violaceum*. He considered it to be a variety of this species and called it *T. violaceum* var. *decalvans*. In a later stage of the condition the scales, hairs and fungus disappear and the patches remain permanently bald.

Jeffrey and Maxwell in their book on "Diseases of China" state that the Chinese term "la li tou,"

so often used in Shanghai, is often used to cover two conditions. The first is favus, which is exceedingly common and destructive. The second, which is also chronic and destructive of the hair-follicles, is characterized by the presence of small silvery scales in large numbers, leaving, in the end, areas of permanent baldness, but not so diffuse and with very much less scarring. They believe that this second condition is also caused by fungus, but they have always failed to find it. I have found this so-called "la li tou" or "la li" very prevalent in the provinces of Hopei, Kiangsi, Anhoe, Chakiang. It may be said in a general way that it is very common south of the Yantse River.

I have mycologically examined six cases of "la li tou"; I succeeded in growing fungi from three of them. From two I isolated *Achorion schoenleinii*. They were therefore cases of favus. From



FIG. 1.—*Tinea decalvans*.



FIG. 2.—*Tinea decalvans*.

the third patient I isolated *T. violaceum* var. *decalvans*, Castellani. The original growth on glucose agar was very slow, with humid surface and of a violet colour. The subcultures of Sabouraud's agar

are of a greyish colour with a violet spot. Mycologically it shows comparatively thick mycelia with short septation, sometimes with lateral conidia. Chlamydospores are also present, and rosary-like mycelial articles with double contour are seen (fig. 3). Culturally, therefore, the fungus is practically identical with *T. violaceum*, Bodin, of temperate zones, but the lesions it gives rise to are so totally different that, at least biologically, it must be considered to be a different variety (var. *decalvans*, Castellani).

CONCLUSIONS.

(1) According to my researches, the commonest type of eczema marginatum (tinea cruris seu guinialis) met with in Japan and Manchuria is caused by *E. rubrum*, Castellani, 1909.

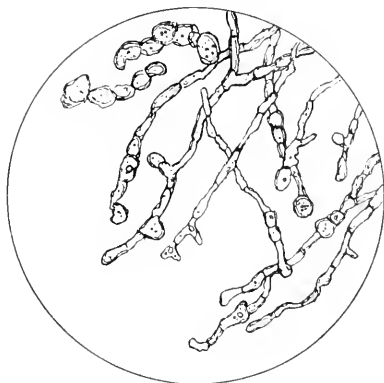


FIG. 3.—*T. violaceum* var. *decalvans*, Castellani.
Hanging-drop culture.

(2) Of three cases of Chinese "la li tou" in which cultivation was successful, *A. schoenleinii*, Hebert, was isolated by me in two and *T. violaceum* var. *decalvans* in one. The term "la li tou," therefore, appears to cover in China at least two conditions—favus and Castellani's "tinea decalvans."

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RHUS DERMATITIS.¹

ALTHOUGH the toxicology of poison ivy (*Rhus toxicodendron*) is fairly well understood, the toxic features of the related poison oak (*R. diversiloba*) have not been studied to a comparable extent. For the harmfulness of the poison ivy, Pfaff placed the responsibility on a substance isolated from the plant and named toxicodendrol. The latter is insoluble in water, but readily dissolves in the organic solvents like ether and alcohol. The product is so active that 0.005 mg. applied to the skin may suffice to provoke local symptoms with pain. A considerable latent power prior to the appearance of the cutaneous alterations has often been described. Recently McNair has come to the conclusion that a polyhydrophenol, to which the name lobinol has been given, is responsible for the irritation of the skin caused by poison oak. The active substance is neither bacterial nor volatile. Poisoning occurs from actual contact with the resinous sap of the plant; but, as McNair points out, it may result through an intermediary agent, which carries the sap, such as particles of soot in smoke, clothing, cordwood, croquet balls and shoes. As in the case of all rhus dermatitis, the most common avenues of invasion of the poison are connected with the cutaneous surfaces, though the respiratory and alimentary tracts may also play a part at times in promoting intoxication with poison oak. The problem of latency has not been solved. With respect to the mechanism by which the dermatitis is spread so that it appears successively on different areas of the body, McNair has ventured several hypotheses. Thus, it may be due to (1) the direct transference of the poison itself by the finger-nails or hands from one part of the body to another, or to new areas from the clothes or the hair; (2) reflex irritation; (3) contiguity of tissue; and (4) varying durations of latency for the different skin surfaces on the body (varying with the respective thicknesses of their stratum corneum, chemical and physical differences in the skin, &c.). Perhaps further study will show an essential identity in the etiology of all forms of rhus dermatitis.

A NOTE ON THE USE OF FLAVINE-STARCH POULTICES IN ECZEMA.²

By J. FERGUSON SMITH, M.A.

THE continuous application of cold starch poultices has been long known as a valuable treatment for an acute dermatitis, though its vogue seems to be much greater in Scotland than elsewhere. The addition of antiseptics, other than the extremely mild and inefficient boric acid, has never hitherto

¹ Abstracted from the *Journal of the American Medical Association*, vol. lxxvi, No. 18, April, 1921.

² Abstracted from the *British Journal of Dermatology and Syphilis*, vol. xxxiv, No. 5, May, 1922.

been suggested, so far as I am aware, mainly because all the older antiseptics to be efficient have to be present in strengths which the inflamed skin will not tolerate. Thanks, however, to the work of Browning and his associates, we now possess in the flavines bodies which are comparatively non-irritating even in efficient concentration, and whose activity is enhanced rather than diminished in the presence of a serous discharge.

Recently a number of cases of severely infected "seborrhoeic" eczema of the head and groin have been treated by the following method, with very encouraging results. In recording such results one can only state one's impression, as they do not lend themselves to tabulation.

Four tablespoonfuls of rice starch and 10 gr. (0.6 grm.) of acriflavine are mixed with a little cold water, one pint of boiling water is added, and the mixture is boiled with constant stirring till it thickens. When nearly cold it is poured on to dressing cloth so as to form a layer half an inch thick. When quite cold and set it is covered with a single layer of gauze or butter muslin, and applied to the part. It is changed three or four times a day, and at each change the part is bathed with acriflavine 1 in 1,000 in 0.85 per cent. NaCl. These applications should be continued until it is considered more stimulating remedies may safely be applied. Only two or three cases have been seen so far which did not respond rapidly to this method, and success has been achieved with it in several cases which had resisted other methods for weeks.

Proflavine is less irritating, though rather less efficient, and could probably be employed up to 1 in 500 with benefit, but so far only acriflavine has been used.

A CASE OF CREEPING ERUPTION IN A EUROPEAN IN THE GOLD COAST.¹

By J. F. CORSON.

This skin affection is stated by Crocker (1903) and Castellani and Chalmers (1919) to have been first described by Robert Lee in 1875; according to Roubaud (1914) the disease was observed in Norway by Hoegh in 1869; while Abraham, in a review of a paper by Knowles (1916), said that cases were recorded in Edinburgh "more than sixty years ago," i.e., before 1856.

When a cause has been found, it has usually been a larva of a fly of the family *Oestridæ*, particularly *Gastrophilus* and *Hypoderma*. Castellani and Chalmers (*loc. cit.*) state that larvæ of *G. harmorrhoidalis* and *G. nasalis*, of *Oestromyia satyris* and of *H. bovis* and *H. lineata* have been found. Looss said that larvæ of *Ancylostoma duodenale* in

their passage through the skin could cause it. Sakurane (1917) found a *Ligula* parasite in a swelling of the skin, and suggested that the parasite of creeping eruption is of this nature. Ikegami (1919) removed from a case of this disease a young worm, said to have been probably *Echinorhynchus sphærocephalus*, but a structure in it like an alimentary canal suggested *Gnathostoma*. Tamura (1919) removed a male *Gnathostoma* resembling *G. siamense*.

The disease is reported to have occurred in Ireland, Scotland, the Shetland Isles, Norway, Sweden, Denmark, Russia, Siberia, Bulgaria, Arabia, Sumatra, China, Japan, the United States of America, Brazil, and West Africa (Senegal, Sierra Leone, Liberia, Togoland, Nigeria and the Cameroons).

The form of the disease occurring in Senegal, called locally Oerbiss or Larbish, and for which no cause has been found, is considered by Roubaud to be of a different ætiology from cases due to myiasis.

The following case showed a close resemblance clinically to the description of Oerbiss given by Roubaud:—

Mr. G., British, living at Secondee, Gold Coast, noticed, about June 18, 1922, a small itching spot on the ball of the left thumb, and thought it was probably due to the bite of some insect. A few days later he noticed that the spot had become a line, and by June 26 there was a curved, raised, blister-like line about three-quarter inch long and one-sixteenth inch in diameter. Itching and a burning sensation were considerable, especially at night. From July 6 to the beginning of October, when opportunities of observing the case ceased, the track progressed irregularly and intermittently round and along the thumb to near the tip. No parasite was found; microscopic examinations of serum and blood taken from various parts of the track and attempts at culture in broth and on agar and blood serum were without result.

No serious attempt to cure the disease was made; an ointment of sulphur and ammoniated mercury was used by the patient, who also opened the tracks from time to time, and rubbed in tincture of iodine with apparent temporary benefit.

PHYTOSIS OF THE FEET.¹

By MILLER B. HUTCHINGS.

It is admitted that the term phytosis, an amputated extremity of more definitely descriptive names, is a makeshift. Epidermophytosis appearing now in the minority in the trichophyton group the term epidermophytosis can no longer be called

¹ Abstracted from the *Annals of Tropical Medicine and Parasitology*, vol. xvii, No. 1, April, 1923.

¹ Abstracted from the *Archives of Dermatology and Syphilology*, vol. vi, No. 6, December, 1922.

sufficiently descriptive. If the term *tinca*, used since 1829, means worm, it is as bad as many other misnomers. As it is impossible to make a laboratory diagnosis in every case, the loose term *phytosis* is used as a convenient designation.

This disease group has few, if any, individually distinctive clinical features pointing to the type of fungus, even as the multitude of dermatitides *venenatæ* may result from as many kinds of irritant as there are cases.

The disease is less contagious than infectious through an intermediary, as witness the frequency of unilateral cases and common sources of acquirement. Cases reported from practically every part of the world almost demonstrate pandemicity.

Commonest foci of infection are public baths, especially showers, and family contamination of rugs and floors, and perhaps towels. Reinfection occurs from shoes, slippers and socks, even after laundering, or from laundry transference. The duration of viability of the fungi is from many months to an indefinite period, even in dry air. The majority of cases seems to indicate cold weather dormancy of organisms, even if the daily temperature reaches 60° F.

There is some preponderance of evidence that the fungi live as saprophytes in the epidermis all the winter, down-growth preventing their removal by normal desquamation, though reinfection from footwear also occurs.

The same difficulty is encountered in treatment as is met with in other infective conditions, such as tuberculosis, syphilis and gonorrhœa; and, as in the case of inaccessible cancer cells, destruction *in vitro* and *in vivo* is hence vastly different. It is essential that desquamation and exfoliation be constantly induced. Salicylic acid is the best agent for this purpose. Aside from the use of an ointment of ammoniated mercury in secondary pus cases, where it is specific, greasy applications, particularly in the daytime, are not only uncomfortable, but ruinous to the shoes. Dyes, from tincture of iodine through the list, are disagreeable and of doubtful efficacy.

All vesicles must be broken up, all bullæ or lakes buttonholed, loose epidermis removed, soap and water freely used, and salicylic acid, from 12 to 100 per cent., employed as a peeling agent. Powders in socks, shoes and slippers have constituted regular treatment, whether salicylic-sulphur or talcum powder, this at present seeming the more effective, salicylic and sulphur equal parts, or occasionally the salicylic alone. Salicylic acid beneath air-tight adhesive is used for the removal of callosities.

If greasy applications are needed at night, Whitfield's ointment, or a salicylic-sulphur ointment or simple petrolatum is used. Ointment of ammoniated mercury seems ineffective against these fungi. Cases extending over two years are reported.

Reviews.

DISEASES OF THE SKIN. A TEXTBOOK FOR STUDENTS AND PRACTITIONERS. J. M. H. MACLEOD, M.D., F.R.C.P. Published by H. K. Lewis and Co., Ltd. Price: £3 10s. net.

Dr. MacLeod has produced a new and important textbook on Diseases of the Skin in the bulky and ponderous tome before us. It is well written, well arranged, and plentifully illustrated. Most of the sections bear the imprint of original researches, and as would be expected from Dr. MacLeod's reputation, the pathological sections are among the best in the book. The section on Tropical Skin Diseases does not bear so markedly the stamp of original observation as do the other sections; it is, however, a very good compilation.

A novel feature in a book on Dermatology which will be appreciated by all is the adoption of the International rules of Zoological and Botanical nomenclature. We congratulate the author on the success of his labours.

FRAMBESIA TROPICA (Parangi of Ceylon). R. L. SPITTEL, F.R.C.S. Published by Baillière, Tindall and Cox.

This little book contains a very interesting clinical study of frambesia or yaws, as met with in Ceylon. The author has purposely omitted to mention historical and experimental data, and has confined himself entirely to the clinical aspects of the malady. His work is a very full and interesting confirmation of the clinical description of yaws given by Numa Rat, and later by Castellani, the course of the disease being divided into three stages: Primary Lesion; Secondary Stage; Late or Tertiary Lesions. The chapter on Diagnosis is very good and is very full. The author gives the following table of differential diagnosis between frambesia and syphilis:—

Frambesia:—

- (1) Not congenital. No reciprocal immunity.
- (2) *Primary sore*-extra-genital.
- (3) *Secondary Stage*: (a) Typical yaw pathognomonic; furfuraceous desquamation and plantar lesions also characteristic; (b) mucous membranes unaffected; (c) itching common; (d) alopecia unknown; (e) eyes unaffected.
- (4) *Tertiary Stage*: (a) Visceral lesions rare, if they occur at all; (b) nervous system scarcely ever seriously affected; (c) blood-vessels; perivascular infiltration and endothelial proliferation of intima not generalized, as in syphilis.
- (5) Parangi is better resisted than syphilis, shown by (a) slight constitutional disturbance; (b) greater exuberance of eruption, scars more keloidal; (c) slower development of lesions.
- (6) Does not respond well to mercury.

Syphilis:—

(1) Congenital.

(2) *Primary sore* usually genital.(3) *Secondary Stage:* (a) Syphilis seldom imitates these; (b) mucous membranes often affected; (c) itching rare; (d) alopecia may occur; (e) iritis common, choroiditis and retinitis rare.(4) *Tertiary Stage:* (a) Visceral lesions occur, e.g., pericellular cirrhosis, gummatous of liver, testis, kidney; (b) nervous system prone to infection; myelitis, cranial nerve palsies, gumma of brain and spinal cord, tabes, G.P.I.; (c) endarteritis obliterans, thrombosis of cerebral arteries, arterio-sclerosis, and aneurism liable to occur.

(5) Syphilis makes more serious wreck of the constitution, affecting more vital structures; while parangi chiefly attacks connective tissues.

(6) Responds well to mercury.

The chapter on Treatment is very good.

Dr. Spiitel is to be congratulated on his work, which will certainly be very useful to all medical men practising in the tropics.

THE PRACTICE OF MEDICINE IN THE TROPICS BY MANY AUTHORITIES. Edited by W. Byam, O.B.E., and R. G. Archibald, D.S.O. Three vols. Pages: Vol. I, 85; Vol. II, 1683; Vol. III, 2550. Extensively illustrated. Many coloured plates. Henry Frowde and Hodder and Stoughton, Bedford Street, London, W.C.2.

In the present issue of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE devoted to tropical skin diseases, one naturally turns to the great work and to the chapters on Skin Disease. In Section XVI in the third volume, p. 2321, we find that the editors command attention; they show a scientific acumen in research, a thoroughness in investigation and a clinical knowledge deep as it is sound. The late Dr. Albert J. Chalmers' part in the writings of the section add to the high repute he has held for many years, a repute which is unexcelled by any other writer in modern medicine. The combination of these two great men has added to the high standard, which is maintained in every section by the writers concerned in this 'epoch-making' production of the Oxford publications.

When one considers that it was but yesterday, so to speak, that tropical medicine has found its way into a front rank in medical literature, the pioneers have every reason to be proud of the position it has attained in so short a time. In this Journal a review is unnecessary; the articles have but to be read to appreciate what has been done in skin ailments, as an example of the style and the perfection of the articles which each ponderous volume contains.

In the voluminous textbook so magnificently handled by Byam and Archibald, the fungi under the chapters on "The Tropical Dermatomycoses" are dealt with in a masterly manner by Castellani

and (the late) Dr. Albert J. Chalmers. The text of the chapters under this heading, followed by those on Dermatobacterioses, Dermatozooses, Dermatozoiasis, Dermatotoxoses, Dermatoplegoses and Tropical Dermatoses of Unknown Causation cover no less than 138 pages of text, and present an exhaustive treatise on subjects which, illuminated by exquisite diagrams, light up what was once a dark corner of the clinical and pathological history of the ailments of the skin.

With such a textbook so rich in up-to-date methods of investigations and clinical observations, the tropical student of to-day, with schools of tropical medicine of ever-increasing perfection, is in a position to qualify himself on the subject of Dermatology as a specialist and as a potent factor to advance our intimate acquaintance with lesions of the skin.

Medical News.

TROPICAL SKIN DISEASES IN PRIMITIVE PERU.

ACCORDING to Escomei (*Annales de la Faculté de Médecine de Lima*, December, 1920), in pottery from the days of the Incas, pitchers and vases, face lesions of leishmaniosis and blastomycosis are often depicted.

At the meeting of the Société Française de Dermatologie, held in Paris on April 19, Dr. Aldo Castellani was elected corresponding member of the Society.

THE Fifth Congress of the Far Eastern Association of Tropical Medicine, Singapore, Straits Settlements, September 3rd—17th, 1923.

Hon. Secretary and Treasurer for Malaya:

J. W. SCHARFF, M.D., D.P.H.,

GOVERNMENT HEALTH OFFICER, SINGAPORE.

Anyone desirous of attending the Congress, or wishing to submit papers, should communicate with the Honorary Secretary.

**Wanted Second-hand Copies of
Theobald's Monograph of the Culicidæ.
Vols. I, II and III.**

Or Vol. III only would be accepted.

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Original Communications.

THE TREATMENT OF BILHARZIASIS WITH ANTIMONY.

By J. B. CERISTOPHERSON, C.B.E., M.D., F.R.C.S., F.R.C.P.

In one of the original communications of the April 16th issue of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, Mr. MacDonagh reminds the reader that the antimony treatment of bilharziasis was first "introduced and published" by him before any other observer, though, apparently, the fact has escaped the notice of some recent writers on this disease.

It appears that in the book, "Biology and Treatment of Venereal Disease" (1915 edition), he writes: "I should like to mention that I have had great success in treating cases of bilharzia with intravenous injections of antimony." The cases do not appear to have been followed up or the subject pursued. The treatment was not recorded in any work on tropical diseases or in any of the medical periodical publications which are the usual means of communicating new facts to colleagues interested.

The treatment cannot be said to have been effectually "introduced" nor made known to people, nor practitioners induced to adopt it.

Neither I nor the people working with me at Khartoum Civil Hospital had seen Mr. MacDonagh's book on venereal diseases, nor had the fact of his having used antimony for bilharzia been communicated to us in any form or shape until after our work had been published, then we saw a letter from Mr. MacDonagh in the *Lancet* claiming priority.

Admitted that Mr. MacDonagh used antimony in bilharziasis, the information remained unnoticed or forgotten—it bore no fruit.

An important remedy for the disease could not have been more effectually hidden than this was in a work which would not be supposed to contain information about tropical diseases.

If Mr. MacDonagh had been sufficiently confident and had published particulars of cases and had worked out details of treatment, he would have been well advised to have published the facts in one of the well-known medical periodicals, or to have communicated the same to his friends who were actively engaged with a malady then incurable in countries where the disease is prevalent.

I met Mr. MacDonagh as late as 1917 in France, but he did not speak to me of a cure for bilharzia, although he was aware that I was working in the Sudan at the time.

We at Khartoum, spontaneously and independently of Mr. MacDonagh, and without any knowledge of anybody having previously used antimony for the disease, began a series of investigations on its action in bilharzia.

When we had in our possession results of sufficient interest we published them in the *Lancet*, and

subsequent articles in the *British Medical Journal* and the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, &c.

These articles included details of the investigations and details recommending the method of treatment.

They were, in fact, a genuine attempt to introduce antimony for the treatment of bilharzia and to place it on a practical basis for the benefit of patients in Egypt and other infected places. Our findings were immediately investigated and checked by competent workers in various countries and confirmed.

We made due acknowledgment at the time to all from whom we had gained assistance, but we owe to Mr. MacDonagh nothing, for we were unaware that he had done any work on bilharzia.

The facts are simple and can be investigated by anyone interested.

Mr. MacDonagh may rightly claim that he was the first to record the use of antimony in bilharziasis, but that he "introduced" the treatment in the sense that he induced others to use it, and "published" it in the sense that workers in the Khartoum Civil Hospital, for instance, were the wiser for his work are beyond the true interpretation of the facts.

He could not have pigeon-holed an important communication to tropical medicine more effectually than by recording it in a work dealing solely with the biology and treatment of venereal disease.

If his statement, absolutely wanting in detail, was overlooked, he cannot blame investigators in tropical diseases who, independently of him and apparently unknown to him, were working and obtaining noteworthy results on the action of antimony in tropical protozoal and other diseases.

NOTE ON THE MOLLUSCAN HOSTS OF THE HUMAN SCHISTOSOMES.

By FRANK MILTON.

MEDICO-ZOOLOGICAL nomenclature increases in complexity almost daily, and it is the obvious duty of anyone to simplify it who possibly can.

There are some twenty species of freshwater molluscs named as the carriers of the human schistosomes: Nine for *Schistosomum hæmatobium*, seven for *S. mansoni*, and four for *S. japonicum*, belonging amongst them to two different orders, four different families, and six different genera.

It is proposed in the present paper to note the inter-relationships of this unwieldy collection and to try and reduce it to its smallest limits.

These recognized hosts are as follows:—

For *Schistosomum hæmatobium*: *Bullinus contortus*, *B. innesi*, *B. brochii*, *B. dybowskii*, *B. alexandrina*, *Physopsis africana*, *Planorbis corneus* var. *metidjensis*, *P. dufoirii*, *Limnæa natalensis*.

For *Schistosomum mansoni*: *P. boissyi*, *P. oliva-*

ccus, *P. pfeifferi*, *P. guadelupensis*, *P. centimetricis*, *Physopsis africana*, *Isidora tropica*.

For *Schistosomum japonicum*: *Blandfordia japonica*, *B. nosophora*, *Katayama nosophora*, *Hypsobia nosophora*.

In addition to these Katsurada [1] states that "he has heard that Miyairi of Kiushu has found the larva of *S. japonicum* developing in a species of *Limnaeus*," and Atkinson [2] is stated to "believe the host on the Yangtze to be a species of *Limnaeus*." These are both secondhand statements, and, as far as I know, have never been confirmed, and I think we may begin our simplification by cutting *Limnaea* out from among the reported hosts.

NOTE.

It is necessary to note that the name *S. japonicum* almost certainly covers more than one species of schistosome, otherwise it would be almost impossible to reconcile the descriptions of observers giving the length of the adult male as varying from 9.5 to 19.5 mm., of the adult female as from 16 to 26 mm., and these, laying eggs varying from 100 by 70 microns to 70 by 40, with spines either entirely absent, exhibiting a "rough knob" or furnished with a well-developed laterally placed spine.

Up to the present there has been only one mollusc identified as carrying *S. japonicum* in Japan; though this snail has been given a variety of names by different observers, it would seem that they all refer to a single species, the true name of which is, apparently, *Hypsobia nosophora* [3]. The other names, being synonyms, may be cut out from our nomenclature.

Of the hosts of *S. hæmatobium*:—

Annandale [4] has recently made a study on the spot of the forms of *Bullinus* found in Algeria and Egypt, and he assigns all the variously named species found by him to be common in these countries, with the possible exception of *Bullinus raymondii*, to one single species, *B. truncatus* Audouin, 1809, giving in his synonymy under date "1913, *B. brochii*, *truncatus*, *contortus*, *dybowskii*, *innesi* Pallary," as all synonymous with *B. truncatus* Audouin. *B. alexandrina* does not figure anywhere in his synonymy; but according to Leiper [5] *Physa alexandrina* was a name provisionally given by Innes to *B. dybowskii*, and *Physa* being an absolute synonym of *Bullinus*, this brings *B. alexandrina* within the same synonymy; and gives us *B. truncatus* as the sole host of *S. hæmatobium*, known to date, in North Africa.

Physopsis africana.—The true position of *Physopsis* does not appear to have been definitely laid down. Kemp and Graveley [3] place it in the Family Physidae, a branch of the *Limnæidæ* other than the *Planorbidae*, the family in which the Western schistosomes (as distinguished from the Far Eastern form, *S. japonicum*) usually develop, but Annandale [6] provisionally includes it in the sub-family *Bullininae*, which, since it harbours both *S. hæmatobium* and *S. mansoni*, would seem to be its most likely position.

Limnaea natalensis.—*Limnaea* is a genus of the Family *Limnæidæ*, which is very widely distributed and would seem to be peculiarly attractive to *Trematode miracidia*, since besides *S. hæmatobium* it harbours *S. spindalis* and *Cercaria indica* XXX, a species closely related to *S. japonicum* in India. *Fasciola gigantica* in India and South Africa, *F. hepatica* in Europe and in North and South America, *Cercaria gracillima*, *C. douthitti*, and *C. douglasi* also in North America, and a varied assortment of the *Cercariae* found by Sewell in the Indian gastropod molluscs. Curiously enough, it has not yet been found carrying *S. mansoni*, though it is more than likely that it will eventually be found to do so, the fact that it has not yet been incriminated being merely a testimony to the incompleteness of our knowledge.

Planorbis metidjensis and *P. dufouri*.—The *Planorbidae* are a family of the *Limnæidæ*, and contains the sub-families *Planorbidae* and *Bullininae*, the most commonly recognized hosts of the Western schistosomes. The sub-family *Planorbidae* is of very wide range, and contains many forms distributed all over the world. It has been divided into seventeen or eighteen subdivisions, which are regarded by Germain and most other authorities, on chronological grounds, as sub-genera, but have been promoted by Annandale, on anatomical grounds, to the rank of true genera. From our point of view the question is not of very great importance, and pending further research they may be accepted by us as mere sub-genera.

Planorbis metidjensis and *P. dufouri* both belong to the sub-genus *Planorbis sensu stricto*, but there is some confusion in their names. There is only one very limited locality, in Southern Portugal, where *Planorbis* is found harbouring *S. hæmatobium*, and only one species of snail is therein infected. This snail was called *P. biscoorneus* by Bettencourt [7] and his colleagues on first discovery, *P. corenus* var. *matigensis* by the same authors [8] in a later communication, *P. metidjensis* still later [9] and finally *P. dufouri* by the latest observer, Franca [10].

Germain [11], in his Catalogue of the *Planorbidae* in the Indian Museum, Calcutta, gives *P. metidjensis* as a distinct species of *Planorbis* s.s., existing in Algeria, Morocco, Spain and Portugal, and makes *P. dufouri* a variety of it occurring in the same countries, and he notes that the differences between them are very trivial. He, however, manages to complicate matters for us by speaking in a footnote of "*P. dufouri* and its varieties" (italics are the present writer's), but since in the body of the work he puts *P. metidjensis* as the primary form, we may accept this as the true name of the host of *S. hæmatobium* in Portugal.

Of the hosts of *S. mansoni*:—

P. pfeifferi and *P. boissyi* both belong to the sub-genus *Planorbis sensu stricto*.

P. guadelupensis belongs to the sub-genus *Planorbina*.

P. olivaceus is also a Planorbina. Germain [11] describes these two forms as separate species each under its own heading and with its own synonymy, but here again he mixes things up for us, for on p. 44 he says: "Further to the South [of Venezuela and Colombia] it (*P. guadelupensis*) is replaced by a very nearly related species, *P. olivaceus*" (italics are the present writer's). On p. 45 he says: "Anyhow, *P. olivaceus* is certainly only a local form of *P. guadelupensis*, between

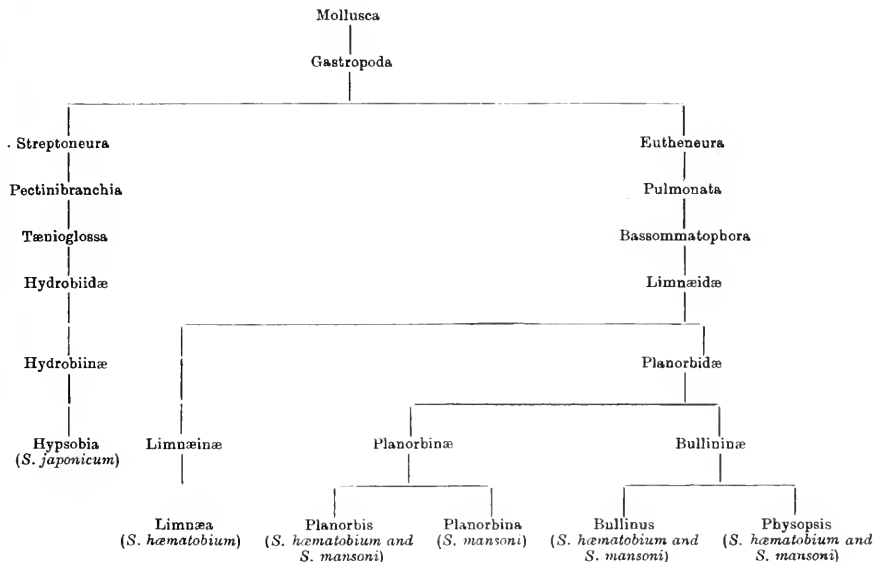
We have then as hosts, as far as we as yet know:—

Of *S. hamatobium*: *B. truncatus*, *L. natalensis*, *P. africana*, *P. metidjensis*.

Of *S. mansoni*: *P. boissyi*, *P. Pfeifferi*, *P. guadelupensis*, *P. (?) Planorbina centimetralis*, *P. africana*, *B. tropicus*.

Of *S. japonicum*: *H. nosophora*.

The following table shows the descent and relationship of these forms:—



which and it all gradations can be traced." On p. 47 he says: "From these characters it is evident that *P. guadelupensis* Sowerby and *P. olivaceus* Spix must be looked upon as synonyms, the latter being merely a local form of the former." On the strength of this, I think we are justified in looking upon the two names as synonyms and cutting *P. olivaceus* out of our list.

P. centimetralis, described by Lutz [12] as a new species in 1918, has, as far as I can gather, not yet been assigned to its particular sub-genus, but it probably also belongs to the Planorbina, the typical Planorbis of South America.

Isidora tropica.—*Isidora* being an absolute synonym of Bullinus, this snail is *B. tropicus*, making Bullinus the host of both *S. mansoni* and *S. hamatobium*.

The host of *S. japonicum* is *Hypsobia nosophora*, an operculate snail of the Family Hydrobiidae, a family far removed from the molluscs harbouring the Western schistosomes, with which it has nothing in common beyond the Phylum, Mollusca, and the Class, Gastropoda.

Suyemori (*Taiwan Igakki Zasshi*, 1922, No. 220, pp. 1-24) gives *Blandfordia formosana* as the host of *S. japonicum* in Formosa. Unless this snail can be identified with *B. japonica* (*H. nosophora*), this name must be added to the list of molluscan hosts of the human schistosomes.

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A DISCOURSE ON THE OUTBREAK OF ALASTRIM IN ANTIGUA, B.W.I.

By E. WM. R. BRANCH, M.B., C.M. Edin.,

Acting Chief Medical Officer,

AND

W. M. McDONALD, M.R.C.S., L.R.C.P. Eng.,

Medical Officer of Health.

THE varioloid disease known as alastrim, Sanaga pox, amaas, Kaffir pox and mild smallpox, has been attracting the attention of observers in various parts of the world recently, and has been epidemic for many months in Dominica, an island of the Colony of the Leeward Islands, British West Indies, and about 100 miles south of Antigua, the seat of the Government of the Colony.

Recognizing the probability of infection from the trade and the coming and going between the two islands, precautions based on a twelve-day incubation period and on vaccination were taken in Antigua to prevent the disease from obtaining a footing there. Passengers to Antigua from Dominica were allowed to land, provided they produced a certificate of successful vaccination and submitted themselves to medical inspection for twelve days from the date of landing. Our experience here shows that both these lines of defence were inadequate.

HISTORY OF THE INVASION.

On January 22, 1923, a negro woman named Paulina Christian, went to the police court in St. John, Antigua, with pustules all over her face. Her appearance aroused the suspicions of Captain Lindop, the Sub-Inspector of Police, who had recently been in Dominica, and had become acquainted with the general appearance of the disease, and he at once reported his suspicions to Dr. Branch, the Acting Chief Medical Officer, who, on seeing the woman, called the Medical Officer of Health, Dr. McDonald, in consultation on the case, and they confirmed Inspector Lindop's suspicions, and decided that it was a case of alastrim. Lt.-Col. St.-Johnston, our Colonial Secretary, who is also a medical man, saw this case with them and agreed with the diagnosis.

This, the first case observed, was well developed, with confluent pustules, and was traced, with the aid of the police, to another woman named Jane Richards, with whom Paulina Christian had been sleeping, and who had recovered from the disease, but still had well-marked pigmented spots. Further inquiry elicited the fact that Jane Richards spent her days in the yard of a Mrs. Bartley, and we found Mrs. Bartley with healed alastrim spots on her face and extremities. This Mrs. Bartley is the wife of a police constable, and had arrived in Antigua from Dominica with her husband in a sailing vessel on December 2, 1922.

There is no doubt that under the quarantine regulations she reported herself to the medical officer of the city daily for twelve days after her arrival and that she was quite well on the twelfth

day. On the fifteenth day, according to her own account, she came out in spots, and, recognizing the nature of the disease, she deliberately concealed it, and her husband, fearing infection, left his home and went to live in the police barracks. They came from Dominica and were well acquainted with the malady.

This woman landed here provided with a *certificate* of successful vaccination, but on inspection she could show no marks of recent vaccination. Her husband fortunately had been successfully vaccinated recently, otherwise he would probably have contracted the disease and infected the police barracks.

It is clearly shown by this case that *certificates* of vaccination are not always to be depended upon, and that the incubation period of alastrim can be more than twelve days.

COURSE OF THE INVASION.

On the same day, January 22, a man was found in the same district of the city suffering from alastrim, making the fourth case in the same area. Meanwhile a brother of Constable Bartley, living in the city, had become infected by his sister-in-law, and had fled to a village about nine miles from St. John, called Liberta, thus establishing a second focus of infection, and on January 26 nine cases of the disease were discovered in six houses in Liberta.

In these two infected areas twenty-eight cases occurred, making, with three others that could not be traced to infection from either town or Liberta, a total of thirty-one, and on March 19 the thirty-first and last case was discovered in the village of All Saints, every case with three exceptions having been traced directly to Mrs. Bartley, the "fons et origo mali."

INCUBATION PERIOD.

Three of these cases were instructive with regard to the incubation period.

(i) Mrs. Bartley.—She did not develop any spots until the fifteenth day after being exposed to infection in Dominica.

(ii) Oliver Benjamin, living at McKinnon's Estate.—This man was seen in the initial stages of the disease, fine pustules like acne on his face on February 25, and a woman named Florence Benjamin, with whom he lived, was sent to the quarantine station on February 8 suffering from alastrim in the pustular stage. She had left Oliver's house several days before she was found with the disease, thus making the incubation period in this case at least seventeen days—probably more.

(iii) Jacob Isaacs, from All Saints village.—On March 19 there had occurred no fresh case for twenty days, and we proposed to issue clean bills of health for the island next day, when to our disappointment Jacob Isaacs was brought in with alastrim of three days standing. In this case also the incubation period was seventeen days.

The diagnosis in the early stages was rather complicated by the concurrent existence in the island of an epidemic of chicken-pox, but the difference as the cases progressed was too well marked to lead to any serious mistake.

None of the white or better-class coloured people in the island were attacked.

After our experience here we view with considerable apprehension the suggestion made at a meeting of the Quarantine Convention in Barbados in April, 1923, that the period of quarantine or surveillance for alastrim should be fourteen days. Prior to this meeting the period as laid down by the Convention was twelve days.

We consider it advisable that the period should be increased to twenty-one days.

REPELLING THE INVASION.

Luckily we have in our Governor, the Hon. Sir Eustace Piennes, a man who was prepared to resist invasion by such a loathsome and economically important disease, and he at once put in force the most stringent and energetic measures to repel the enemy, bringing to bear all the legal, administrative and economic forces he possessed, and assuming any others that were necessary to his purpose, with the notable result that the enemy ceased all resistance on March 19, when the last case of the disease was sent to quarantine in the person of Jacob Isaacs of All Saints, and that on the sixth day of April we were able to report "All clear" and to issue clean bills of health.

LEGISLATION.

Some legislative steps were at once taken to legalize certain measures adopted in dealing with the crisis. By an Order in Council alastrim was added to the list of notifiable infectious diseases, and regulations were made empowering the Governor to close schools and places of public amusement, to declare "prohibited areas," and to enforce revaccination.

PATIENTS AND CONTACTS.

Each patient and all direct contacts were vaccinated promptly and removed to the quarantine station at Fort James. For this purpose one of the Public Works motor lorries was commandeered and, with its driver, kept in the quarantine station.

The houses in which the patients lived were disinfected and generally cleaned up, and two, whose dilapidated and weather-worn condition precluded any effectual disinfection, were burned with their contents after an adequate compensation had been arranged for their owners.

QUARANTINING OF INFECTED AREAS.

His Excellency, after a personal inspection, decided to quarantine the portion of the town, with more than 2,000 inhabitants, in which the first cases had occurred. In describing the work done and the methods adopted to make such a quarantine effective, I cannot do better than quote from

a preliminary report on the epidemic by Lt.-Col. St.-Johnston, Colonial Secretary:—

"Police, strengthened by special constables, were placed on guard at frequent intervals along the boundary streets, and yellow flags and 'Out of Bounds' notice boards set up all round the area. Arrangements were made for keeping up the supply of food-stuffs to the five retail stores that happened to be within the area. Extra water supplies were opened up, and special arrangements were made for the removal of night soil. A number of minor Government employees, street weeders, sanitary men and others were found to be residing within the quarantined area, and as their wages were allowed to run on they were given as far as possible special duties as to sanitation, message carrying, &c., within the area. Training school boys were detailed as corresponding messengers *outside* the area, but were not allowed to cross the barriers."

The same plan of isolation and quarantine was adopted in the case of the village of Libertá, but the natural configuration of this village, with its hills, ravines and watercourses, and irregular outline, rendered it very difficult to keep its population of agricultural labourers within bounds, and to prevent surreptitious nocturnal visits from devoted friends, who were still sceptical about the risk involved, and at first regarded the whole performance as an iniquitous and deep-laid scheme of the Government and as a stupid attempt to interfere with the workings of Providence. It is likely that the few sporadic cases that occurred in non-infected areas might have been traced to a break in the Libertá cordon.

HOUSE TO HOUSE VISITATION.

While these areas were quarantined, a period of twenty-one days dating from every fresh case found, a daily house to house inspection by sanitary officers was carried out, with the object of noting and at once reporting any suspicious cases.

RELIEF WORK.

(From Colonial Secretary's Report.)

"Owing to the shutting up of several thousand people in Libertá and the quarantined areas of St. John, it was necessary to arrange for pecuniary relief to those without private means and unable to earn their own livings. Twelve gentlemen, chiefly Government officials, were asked, and willingly consented to take their turn at presiding at tables stationed at three corners of the St. John area and pay out small amounts, a few pence at a time, to deserving cases on the recommendations of the relieving officer, keeping careful records in a cash book of all amounts distributed. Similarly the Reverend Mr. Francis (Resident Moravian Minister) undertook to perform *lik.* duties in Libertá."

The people in Libertá, and also in the quarantined area in town, soon appreciated the fact that these measures were for their own good, and were

cheerful and orderly during their irksome confinement, enjoyed their enforced picnic, and being able to sleep and eat as much as they desired without having to work for these luxuries. As far as I am aware, there were only two police prosecutions for breaking bounds.

VACCINATION.

Infant vaccination is compulsory here, not even the children of conscientious objectors and Christian Scientists being exempt; but the Order in Council to vaccinate the 28,000 inhabitants of the island seemed rather a "tall one," especially as we were provided only with the monthly supply of lymph for the usual infant vaccination. But the telegraph wires soon became red-hot with messages to the neighbouring Colonies, New York and London, and a stream of lymph began to flow into the island sufficient for our needs. The small supply on hand was diverted from its usual course, and used to vaccinate contacts and infected areas as far as possible.

But soon an organized campaign was started. The island was divided into definite sections, and posters were put up ordering the people to come at fixed times to appointed centres to be vaccinated, and stating that the police would prosecute anyone who could not produce a certificate of successful vaccination after a certain date. In this work the medical officers were ably assisted by a number of laymen, and the Colonial Secretary, Lt.-Col. T. R. St.-Johnston, himself a medical man of long experience, could not resist the "call to arms," and generously devoted a good deal of his time, already fully occupied in organizing the fight, to the actual work of vaccination.

In a short time we had 26,068 successful vaccinations actually registered, so that, taking into account the fact that no children under 5 years old were revaccinated, the entire 28,000 were accounted for.

Again just at first some difficulty was encountered in inducing the people to come to be re-vaccinated, but they soon saw the powerful effect it had on keeping off the disease, and before long they came willingly, and eventually reached the stage of clamouring for the treatment.

Excellent work was done by everyone concerned in limiting the number of cases to thirty-one and in eliminating the disease from the island in two and a half months.

Unfortunately there is no pathological laboratory in the Colony, so we are not in a position to furnish any biological or histological observations.

Clinically the disease is very much like smallpox, and undoubtedly is generically the same, but specifically different. It seems to us to bear much the same relation to smallpox as paratyphoid does to typhoid, or yaws to syphilis.

In our experience vaccination is strongly protective.

We look forward to the time when the relationship of variola to vaccinia and to alastrim will be clearly demonstrated.

ALASTRIM.

Symptoms.—None of the cases were seen in the very early stages before the vesicles were out, and it was impossible to get a definite history of prodromal symptoms. All the cases stated that they had fever for a day or two before the vesicles came out.

TABLES.

<i>Smallpox.</i>	<i>Alastrim.</i>	<i>Chicken-pox.</i>
Attacks children and adults.	Mainly attacks adults.	Supposed to be a disease of childhood, but many of the cases here are adults.
<i>Incubation.</i> —Almost invariably twelve days.	<i>Incubation.</i> —Twelve to seventeen days, or even twenty-one days.	<i>Incubation.</i> —Ten to nineteen days.
<i>Prodromal Illness.</i> —Usually severe.	<i>Prodromal Illness.</i> —Very slight.	<i>Prodromal Illness.</i> —Generally absent.
<i>Eruption.</i> —Fully out in thirty-six to forty-eight hours.	<i>Eruption.</i> —Comes out usually in successive crops over period of ten days.	<i>Eruption.</i> —Comes out in successive crops over period up to five days.
<i>Vesicles.</i> —Not fully formed until third or fourth day; induration of base umbilicated; multilocular; do not collapse when pricked.	<i>Vesicles.</i> —Mature irregularly; domeshaped; uniform size; unilocular; not umbilicated; covering layer of epithelium thick; collapse when pricked.	<i>Vesicles.</i> —Fully developed; all stages seen; irregular shape and size; thin-walled; flat, not domeshaped; superficial; collapse readily when pricked.
<i>Distribution.</i> —Specially copious on face and extremities.	<i>Distribution.</i> —Similar to smallpox.	<i>Distribution.</i> —Eruption far more copious on trunk (chest and back), then thighs and upper arms; very few on extremities and face; palms sometimes affected.
<i>Mortality.</i> —Varies, may be 25 per cent.	<i>Mortality.</i> —None of our cases died.	<i>Faccination.</i> —Does not protect.
<i>Vaccination.</i> —Protects.	<i>Vaccination.</i> —Protects. All our cases with one exception had never been vaccinated. The exception was a man of about 40 who had been vaccinated in infancy, and he developed a very mild and modified case of alastrim.	

Distribution of Rash.—In the majority of cases the distribution entirely conformed to the distribution of the rash in smallpox, specially copious on face and extremities. (The last case seen had very few vesicles on face.) Present on palms; not noticed on soles.

Eruption.—Came out in successive crops.

Vesicles.—These were large, uniform size generally, circular, dome-shaped, prominent, mature irregularly, covering layer of epithelium thick. Vesicle collapses when pricked, not umbilicated. Drying up commences early about tenth day. Slight early pitting; not permanent.

Differential Diagnosis.—For some time we have had an epidemic of chicken-pox. Therefore very many suspicious cases were reported, and the differential diagnosis was always important and sometimes difficult. We were seeing cases of chicken-pox almost daily, and it was very interesting comparing the differences between the two diseases. This is set out in the following tables:—

VACCINATION.

As stated in the tables, vaccination protects very thoroughly. It was very remarkable that none of the contacts, who were all vaccinated, and were isolated in the quarantine station and in their own houses, developed alastrim.

At one time the chances of promptly stamping out this epidemic of alastrim seemed very small, but with the energetic measures adopted (in promptly isolating and quarantining all cases and contacts, and in the compulsory vaccination and revaccination of the entire population of the island), the epidemic fizzled out and was all over in about two months, only thirty-one cases occurring in all.

There is no doubt whatever that vaccination and revaccination materially helped to bring about this happy issue.

BLOOD STUDIES IN SMALLPOX, WITH SPECIAL REFERENCE TO ALASTRIM.

By Professor W. H. HOFFMANN, M.D. Habana (Cuba).

DURING the last three years I had the occasion to see in Cuba an epidemic of smallpox, which on account of its slight character might remind one of that disease, which was often considered as West Indian modified smallpox, or alastrim.

In Cuba, on the authority of Dr. Guiteras, the disease from the very beginning has been considered and treated as true smallpox, and I fully agree with this opinion. In the first time of the epidemic I made the inoculation of the cornea of the rabbit in many cases and regularly, with the result of producing the specific epithelial proliferations in which the Guarneri bodies could be demonstrated.

All the cases that occurred in Habana were strictly isolated for forty days in the Las Animas Hospital, the Government's Isolation Hospital for Infectious Diseases, where I had occasion to see them during the whole period, making daily, or

every few days, the blood studies in the Research Laboratory of the Health Department.

The total of observations on which my conclusions are based is about 300. I was making at the same time a great number of other blood counts in all kinds of infectious diseases, which were used for comparative studies.

I made systematic observations about the white count and differential count in all the cases of smallpox that occurred, and also about the number of red cells and the hæmoglobin content in most of them.

The latter two were not seriously affected. The number of red cells may go down by 10 or 20 per cent.; but this sign has no great practical value, especially not in the tropics. There are certainly no marked degenerative changes in the red cells. Also the hæmoglobin content is only decreased by 10 to 20 per cent. Severe degeneration of the blood might be rather considered as a symptom, which speaks against a simple infection with smallpox, and, on the contrary, more in favour of some other disease.

The results of the white counts in my cases are the following:—

The total number of leucocytes is subnormal, even leucopenic (4-6,000), during the first three days of the disease—that is, during the time of prodromal symptoms—in my opinion owing to the want of sufficient immunity reaction of the organism, which allows the virus to enter the body. Only after this time—that is, on the fourth day of the disease—a strong increase of leucocytes is observed, the number rising rapidly and being highest with averages of 17,000 from the ninth to the fourteenth day; but higher values up to 30,000 are frequent, and even 40,000 have been counted by me.

The total count remains high during the whole of the third week with averages of 10-12,000, and in individual cases as many as 24,000 leucocytes.

From the fourth week the total numbers are sinking and approaching more and more to the normal, but from time to time there are still periodical elevations with higher leucocytic values. During the whole period of the fourth, fifth and sixth week the average numbers remain above the normal between 9-12,000 without any apparent relation to the suppuration, which, as it seems to me, is not so much responsible for the character of the blood curve as is the specific effect of the virus.

At the end of the sixth week the blood composition has not yet returned to the normal, but my observations could not be continued beyond that time because the patients left the hospital.

During the whole observation period the percentage of the polymorphonuclears remains below the normal, which is about 65 per cent. During the first six days there is an average of 30-20 per cent., and in some cases only 12 per cent. They rise a little in the second and third week up to 45 per cent., but in the fourth to sixth week again remain low, between 30-40 per cent.

The juvenile forms, on the contrary, which normally are only 1.3 per cent., are increased during the first week up to 15.33 per cent.; afterwards the number is sinking, but remains little higher than normal (3.10 per cent.) during the whole disease.

Also the transitionals are augmented in the first week. Later they keep within normal limits.

The eosinophiles show a so well-marked increase that this is one of the most characteristic symptoms. During the first three weeks they are found in numbers of 3.10 per cent. on an average. From the eighteenth day there develops a very marked increase to averages of 15.20 per cent., and sometimes up to 30 per cent. This very pronounced and unusually high eosinophilia is often still present at the end of the sixth week. I think that the eosinophile cells are of great importance for the curative processes and for the development of immunity.

Corresponding to the low number of polymorphonuclears, the lymphocytes regularly show a striking increase. With exception of the first week almost all the counts of lymphocytes are above the normal of 24 per cent., as also the whole curve of average values is moving on a higher level.

The average rises in the first week up to 45 per cent., and in the third as high as 65 per cent. In the fourth to sixth week the lymphocytic values still kept between 40.50 per cent. During the whole course of the six weeks a lymphocytosis of 60.75 per cent. is not rare.

The relative lymphocytosis is especially characteristic for smallpox.

Also the large mononuclears are increased in number during the whole time to 4.8 per cent., and it is not rare to find 20 per cent., the highest values being observed in the first two weeks.

A characteristic feature is the presence in the blood of certain pathological cells, the myelocytes, which scarcely ever are missed in smallpox, whereas they are not found in normal blood nor in most of the infectious diseases, except chicken-pox. They are more frequent in the first three weeks with an average of 1.3 per cent., but many times 4.5 per cent., and occasionally even 10.12 per cent. Of course in doubtful cases those cells may have a decisive importance.

The study of the fragmentation of the nuclei after the method of Arneth also reveals characteristic changes. Juvenile cells with one or two nuclei are increased in number in the beginning, and according to this the Arneth Index is high—up to 90 compared with a normal one of 62—during the first week. Later on the index is lowering and more and more approaching to the normal.

The changes of the blood are very marked and in their totality very characteristic for smallpox. I do not know another disease which produces similar changes with exception of chicken-pox, in which indeed—curious and remarkable enough—the differential count in many ways is similar to the one in smallpox. But there is another factor just in the blood which will easily allow the differen-

tial diagnosis of these two diseases—namely, the total white count, which in smallpox reveals the marked leucocytosis from the third day to the end of the sixth week at least, whereas in chicken-pox, after my own experience from a great series of cases observed here during twenty days of their disease, the number of white cells remains normal or sub-normal, with only in some cases a slight increase between the eighth to tenth day to no more than 10.12,000 leucocytes.

Of all the clinical methods there is none more practical and simple than the current blood tests, which cannot be recommended enough for clinical purposes of diagnosis in infectious diseases. I have used the examination of the blood during the smallpox epidemic with best results in doubtful cases to give a definite opinion not only in the positive but also in the negative sense. Supposing that all the technical conditions are fulfilled, which alone can warrant the exactness of the results, this method will prove perfectly reliable to the hygienist as a guide for his actions. If the typical changes are found in the blood, this will unconditionally justify and require the severest and fairest going measures; if they are missing, the greater responsibility may be accepted of avoiding or dropping such measures.

The blood changes, as described here, are still very marked after six weeks of the disease, so that even in cases already cured and free from other symptoms, the blood may eventually give valuable hints to the sanitary officer on the character of a disease passed more than six weeks ago. I had no possibility to state how long the changes may remain visible in the blood. Studies on this line, where opportunity is given, would be very important; in smaller places it may be much easier to make them than in a big centre like Habana with a fluctuating population.

Possibly there may be certain relations between the leucocytic changes and the curative and protective processes of the body. Further studies on this line, therefore, might open some new views with regard to treatment and prognosis.

Especially comparative studies may throw some new light on the alastrim question.

As already mentioned, the cases observed during this epidemic in Habana and Cuba have been considered as true smallpox, with magnificent result for the control of the disease. It is difficult to trace the origin of the Cuban epidemic to its sources. There is every year a considerable movement of natives from the neighbouring islands—known as alastrim centres—especially coloured people, who come here to work in the sugar mills during the harvest of the sugar-cane. But at the same time there is also a great afflux of lowest-class immigrants from European countries, who often arrive here in crowded steamers not always in the best hygienic conditions.

It is sure that several of the cases which I saw were directly coming from such places where alastrim is prevailing, so that a connection with the alastrim epidemics might seem possible. I did

not find with them any remarkable difference in the blood from the other cases, in which the infection is perhaps of European origin.

The alastrim question is always still under discussion, and will probably remain open as long as we do not know the specific germs of this group of diseases. I think that just the method of the blood examination may possibly contribute very much to the further elucidation of the problem. It would be of great value consequently if for that purpose blood studies of the same kind were published from countries with undoubted pure alastrim epidemics, and also from countries with the severest forms of smallpox as China and India. I am publishing for that reason a list of the averages which I have found in our cases in Cuba during forty days of the disease which may be used for comparative purposes.

BLOOD IN SMALLPOX

Day of Disease	Total number of leucocytes	Eosinophiles	Basophiles	Tartrates	Myelocytes	Transfusions	Polymorphonuclears	Lymphocytes	Large mononuclears	Armeth index
1	6,000	7	1	15	0	2	28	41	6	66
2	6,000	9	0	32	0	9	13	29	8	89
3	6,000	10	0	28	1	11	18	21	10	85
4	9,000	7	0	16	1	5	19	44	6	78
5	11,000	4	0	24	2	4	22	30	8	73
6	11,000	11	0	15	2	5	17	44	5	75
7	14,000	5	4	24	3	5	27	31	6	67
8	14,000	7	17	3	4	4	27	35	7	67
9	17,000	3	15	2	3	3	38	24	4	54
10	15,000	7	10	1	2	3	35	39	9	50
11	15,000	5	11	1	2	3	34	40	7	52
12	12,000	7	1	9	3	2	30	46	3	52
13	16,000	5	13	2	3	3	29	41	7	61
14	13,000	3	0	4	1	1	46	43	2	33
15	11,000	5	1	7	1	1	36	49	2	51
16	12,000	2	1	9	1	3	29	48	8	57
17	11,000	2	1	6	1	1	23	66	2	47
18	10,000	7	1	5	2	1	37	52	5	50
19	9,000	7	1	20	1	3	28	39	5	68
20	12,000	5	0	2	2	0	60	29	2	24
21	12,000	6	0	6	0	2	30	51	5	52
22	9,000	9	1	8	0	2	38	38	5	45
23	10,000	6	1	7	1	1	37	44	4	46
24	9,000	2	1	5	0	2	28	55	7	47
25	12,000	9	2	8	1	1	34	43	5	47
26	8,000	3	0	6	0	1	37	46	5	44
27	9,000	5	2	4	1	0	51	33	4	43
28	10,000	14	1	4	0	1	29	45	7	48
29	11,000	11	0	7	1	2	30	42	10	47
30	12,000	13	0	2	0	1	36	46	2	37
31	10,000	12	1	3	1	1	31	53	1	40
32	8,000	13	1	7	0	1	34	41	4	50
33	11,000	7	1	2	1	1	38	43	6	43
34	9,000	12	1	6	0	1	31	46	5	44
35	8,000	9	0	16	0	2	29	37	7	62
36	14,000	20	1	11	0	1	37	26	4	60
37	8,000	5	0	1	1	2	42	46	3	37
38	10,000	19	0	3	0	1	29	42	6	49
39	9,000	7	0	8	0	1	32	49	5	44
40	8,000	5	1	5	0	0	34	48	5	43

NORMAL BLOOD

8,000	2	1	3	0	1	66	25	3	62
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RESULTS.

(1) The blood in smallpox shows very marked changes in total number and in relative distribution of white cells—namely, very high leucocytosis beginning from the fourth day, unusually high eosinophilia, very marked relative lymphocytosis, presence of myelocytes, initially high Armeth index.

(2) Only in chicken-pox a similar differential count is observed; but the differential diagnosis in this case is very easy because of the absence of leucocytosis in chicken-pox.

(3) The changes are still very marked at the end of the sixth week, and probably longer; this makes possible a retrospective diagnosis even after clinical recovery.

(4) I recommend further studies on the same line which promise practical results; especially comparative studies may throw some new light on the alastrim question.

A Hyaloma (Pseudocolloid Milium or Colloidoma Ulcerosum?) simulating Morpheiform Epithelioma (Rudolph Ruedemann, Jr., M.D., *Archives of Dermatology and Syphilology*, vol. v, No. 5, May, 1922).—The lesion on the face of this patient clinically suggested a morpheiform epithelioma, and was diagnosed as such. Pathologic study apparently demonstrated that it was an unusual clinical type of colloid degeneration of the connective tissue, perhaps best designated a hyaloma.

The degeneration was preceded by a slowly extending inflammatory process, which was followed by atrophy and the disappearance of most of the hyaline or colloid material, possibly as a result of the activity of macrophages, although this point is not regarded as fully established.

Natural Immunity to Infection and Resistance to Disease as Exhibited by the Oriental (Ralph W. Mendelson, *Philippine Journal of Science*, vol. xxii, No. 2, February, 1923).—Specific immunity to typhoid infection can be demonstrated in 15.5 per cent. of the people. This is in the nature of a racial immunity, acquired as the result of using, for many generations, an infected water and food supply.

Although resistance to certain diseases, such as cholera and plague, cannot be demonstrated by specific blood reactions, it is present in the form of a marked resistance to germ infections as a whole—that is, "general infection immunity."

The nervous system of Orientals is much more resistant to the effects of germ infection than is the nervous system of Occidentals.

The natural immunity to infection and resistance to disease, as exhibited by the Oriental, is of real value to the health officer working in the East under present conditions.

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A MINISTER OF HEALTH.

ONCE more the question of the post of the Minister of Health comes to the front. Sir G. Lenthal Cheate, K.C.B., has, shall we say,

attacked the subject with vigour in the 1923 January number of the *Nineteenth Century*, and again in the *Saturday Review* of June 16, 1923. He describes the Ministry as being in an inept condition. The dictionary defines inept as Not apt nor fit; unsuitable; foolish; inexpert. Who or what is not apt, foolish, &c.? Is it the man who would minister, or the Ministry which administers "Public Health"?

Public health seems to be a part, or is it the whole of the work the Ministry has to see to? What kind of a man is wanted to direct so huge a machine? The Department has outgrown the capability of any living being to direct, to manage, to guide, and at the same time to be parliamentary enough to guide, to steer, and to force it through the obstructions and pitfalls which beset its course. "Force" it along is really the term best suited to indicate what he as a parliamentarian has to do. His position in this department of Government is not a bed of roses; it is often flung at any doctor that happens to have a seat in Parliament, and such men as happen to be Radicals in politics are by a "Liberal" Government, or such men as happen to be Conservatives are by a Conservative Government, sent to fill the gap in their respective Cabinets. Some contend, as Sir Lenthal Cheate does, that he should be a doctor, others cite the fact that the head of the Navy is never a sailor, nor is the head of the War Office an active soldier, and from the dozen or so of doctors who enter the ranks of one or other of the great groups of politicians, someone or other has to be chosen if a doctor must be selected. Let any medical man attempt from amongst his own acquaintances to name a man whom he thinks would be likely to fill the position of Minister of Public Health. Have we (doctors) any man whom we could offhand recommend for the post? The fact is few of us know the duties required of such a post, and our opinion is practically worthless. The writer did profess to know a man he considered suitable; he served under him—or was it with him?—as the Hon. Secretary to the Institute over which this man presided, and even now, after a long lifetime experience, he (the writer) still regards his earlier judgment as correct. The writer nominated his hero as qualified to stand for Parliament, and fit to fill an honourable seat with the sole object that he might be made Minister of Public Health. He was a professor in one of our best known medical schools, an excellent speaker and debater, an organizer endowed with a business temperament, a man of affairs, &c., yet he was unsuccessful at the polls, and the nation lost a Minister of Public Health, one capable of holding his own in Parliament and out of it in a manner which brooked no interference with medical or sanitary methods by laymen in medicine or hygiene. Perhaps others in the profession have as strong a man amongst their acquaintances and may hesitate to bring him forward. By a suitable man is not meant a placid, agreeable individual with a fad perhaps, but a strong man—strong in the sense

of a Gorgas, who brooked no lay authority, however highly placed, interfering with matters which belonged to public health or with doctors' predominance and prerogative. It is long since Gladstone declared that the doctor in the future was to be the ruling power in public matters, and a few more Gorgases in the world will hasten the advent of the wizard's prophecy. The time is approaching when Red Cross "commissioners" will not be sent on to spy out the land to see if doctors are required at the seat of war or where epidemics prevail. We hope, and it is our own fault if ever we see a military man placed in charge of an outbreak of disease in any city or district, as General Gatacre was when plague broke out in Bombay in 1896 and a lawyer in Hong-Kong elected to superintend the plague outbreaks in 1894.

Doctors are not allowed to assume command of medical and public health affairs. The excuse is that their work is much too valuable to be frittered away on legislative and the details of organizing work. In the Army, both in India and at home, the health of the Army is managed by a senior staff of medical officers who are trained specialists in public health work and sanitation. Yet when an epidemic occurs these men are set aside and placed under a lay authority, be it a town councillor, a mayor, a provost, a military general, or an admiral. To the medical officer the idea of the half-crown doctor to be called in when it suits the family, and to be dismissed when they please, still clings to the profession even in the Army and the Navy.

The day will come when the medical men will hold up their heads and refuse to be "bossed" by lay authorities; when the doctors will rule in their own profession and "Gorgas" tactics will again come to the front. When a trained sanitarian will deal with sanitary and public health affairs, and those ignorant of the elements of hygiene will take their proper places in the scale of service, not as commanders, but as servants.

The public Press has lately been deluged with the ignorance of the doctors in Gloucestershire who failed to diagnose cases of smallpox in their midst. The doctors, had they their own way, would have no cases of smallpox in Gloucestershire or anywhere else. Interfered with in their own work, they have had to stand aside whilst a timorous House of Commons legislated on the matter of vaccination against smallpox, and the inevitable has occurred—namely, appearance of smallpox here and there, where the people have taken matters into their own hands and dictated to the community that they are the rulers to do as they like and prevent the administration of preventive medicine.

The first thing a strong Minister of Health would and should do is to stop this arrant nonsense, this scare about the liberty of the subject, an excuse merely for getting votes. As long as vote collecting remains a recognized system of legislation, the sooner the House of Lords is the sole chamber of government the better it will be for the country.

The only people who can shape the Ministry of Public Health to the needs of the country is the medical profession alone, and it lies with the members of that profession to declare their requirements and see that they are fulfilled. The members of the House of Commons on more than one occasion told the doctors throughout the country that they did not care a brass farthing what the doctors thought or said or voted, that they had no power individually or as a group; and that there is a suspicion that as the Russians welcomed a fool in the position of Foreign Minister to their country, so a medical man in the post of Minister of Health is welcomed as one not likely to thwart their own schemes to obtain votes.

It is the man in the post that counts, not the system that seems to direct the Ministry. The man makes or mars the Ministry, not the Ministry the man.

Note.—Tropical men are discussing the question of the Gloucestershire outbreak of "modified" smallpox being identical with the "alastrim" of the West Indies. As the two ailments are "associated" in the West Indies, there is no reason why they should not be equally so in England. True plague was associated with pestis minor in the Hong-Kong and China outbreaks in the 1894 epidemics, and a parallel in regard to smallpox is not inconceivable. In true plague recoveries were few, but in pestis minor no deaths occurred, as is reported to be the case in the present milder smallpox outbreak now raging.

J. CANTLE.

Annotations.

Tinea Versicolor of the Face (David M. Sidlick and Edward F. Corson, *Archives of Dermatology and Syphilology*, vol. v, No. 5, May, 1922).—*Tinea versicolor* of the temperate zone exceptionally occurs on uncovered parts of the body. The numerous cases of *tinea versicolor* observed by Powell in India in all probability belonged to the tropical variety of the disease (*tinea flava* of Castellani).

At present the *Microsporon furfur* has not been successfully cultivated.

The face of the patient in the case in question cleared rapidly under the same treatment that was effective on the covered parts, while the tropical variety of pityriasis is cured with great difficulty.

Chemotherapy of Antimonial Compounds in Kala-azar Infection (U. N. Brahmachari, *Indian Journal of Medical Research*, vol. x, No. 4, April, 1923).—The author describes a case of cutaneous leishmaniasis due to *Leishmania donovani*, and shows for the first time that these parasites can sometimes produce only skin manifestations in man, without visceral lesions. The condition followed antimonial treatment of kala-azar.

Urticaria due to Streptococcal Sensitization (Arthur F. Hurst, *The Practitioner*, vol. cviii, No. 6, June, 1922).—Recently Dr. H. W. Barber described how urticaria may be caused by faecal infection and may be cured by its eradication. In support of this discovery, the author describes a case of urticaria following septic wound of the thumb; recovery took place fourteen years later after treatment with a vaccine made from streptococci isolated from a tooth.

Metabolism in China (B. E. Read and S. Y. Wang, *Philippine Journal of Science*, vol. xxii, No. 2, February, 1923).—Analysis of the chemical constituents of Chinese urines excreted by various classes of people taking different diets has been made.

The results have been compared with those obtained for Europeans, subjects of India, Asiatics in Singapore, and Europeans in Queensland.

The absolute quantities of nitrogen and urea are low, being similar to the results obtained by Campbell for Asiatics in Singapore. He attributed these low results to the indirect effects of heat and humidity. The results in these cases were obtained in a dry, cold season, and diet is considered to be the sole reason for such low results.

The percentage of ammonia nitrogen is far above the European normal, but agrees exactly with Campbell's and McCay's findings. Disregarding climate, it is believed that high cereal diets are the cause, or it may be a racial characteristic.

The Chinese do not excrete large amounts of chlorides. Bunge's theory that vegetarian diets produce a greater craving for salt can be ignored in a country where Government monopoly makes salt a luxury.

Values obtained for neutral sulphur were very high. Young, of Queensland, obtained similar results, from which he declined to draw any definite conclusions. Dietary causes are again suggested, introducing an exogenous rather than an endogenous factor.

The results in general confirm those of others working on Asiatic subjects. The environments being so different it is concluded that heat and humidity are not the controlling factors.

Definite conclusions concerning the seeming abnormalities of Asiatic metabolism are deferred until abundant data have been collected from a variety of sources in the Orient.

Clinicians working in the Orient should adjust their standards in chemical analysis accordingly.

Influence of Sodium Salicylate upon the Arthritis of Rabbits inoculated with Non-hæmolytic Streptococci (Homer Swift and Ralph Boots, *Journal of Experimental Medicine*, vol. xxxvii, No. 4).—Rabbits inoculated intravenously with non-hæmolytic streptococci, while under the influence of full therapeutic doses of sodium salicylate,

developed almost as many inflamed joints as the untreated controls similarly inoculated.

The salicylated rabbits, on the other hand, had a much higher proportion of mildly inflamed joints than did the controls.

This anti-inflammatory action was most evident in the animals inoculated with streptococci of the lowest virulence, and could not be demonstrated in animals inoculated with hæmolytic streptococci.

Malaria in Chimpanzees in Sierra Leone (S. Adler, *Annals of Tropical Medicine and Parasitology*, vol. xvii, No. 1, April, 1923).—Thirteen chimpanzees were examined for malaria in Sierra Leone. Two young animals were found to be infected with a parasite indistinguishable from *Plasmodium falciparum*.

Older animals were negative, and resistance following attacks in early life is, therefore, suggested.

Blood from one chimpanzee containing only crescents failed to infect another chimpanzee.

Both infected animals on post-mortem examination showed fatty changes in the liver.

The Ætiology of Blackwater Fever (B. Blacklock, *Annals of Tropical Medicine and Parasitology*, vol. xvii, No. 1, April, 1923).—The term "blackwater" fever, being applicable only to conditions in which hæmoglobin is present in visible quantities in the urine, is too restricted.

The importance of pre- and post-hæmoglobinuric states, which are inherent parts of the disease, is apt to be lost sight of owing to the exclusive use of the term "blackwater" fever. Some such term as "occult" or "subliminal" blackwater fever might be used to express these conditions.

A differentiation of tropical hæmoglobinurias into malarial, quinine and specific blackwater types, is not possible merely on the basis of the presence and degree of jaundice, or on the relative severity of the signs or symptoms.

The existence of a parasitic cause of blackwater fever has been frequently suggested; an experimental human inoculation, with blood from a severe case of blackwater fever which ended fatally, elicited no evidence in favour of the existence of such a parasite after an observation period of two months.

Granuloma Inguinale (I. M. Gage, *Archives of Dermatology and Syphilology*, vol. vii, No. 3, March, 1923).—The disease is a definite clinical entity. It occurs in the United States, being endemic in some States, especially in the extreme Southern States. It is endemic in Louisiana.

The cause is probably the organism described by Donovan, possibly a protozoa.

The disease presents definite clinical symptoms which extend over long periods. The symptoms

vary somewhat in different persons for the most part, showing the typical granuloma with a sero-sanguineous discharge.

The pathologic picture is that of a sclerosing granuloma.

Tartar emetic administered intravenously seems to be specific, although it is thought that when the lesions are accessible to surgical excision this procedure, combined with tartar emetic, will considerably shorten the healing time.

Every patient presenting a granulomatous lesion of the external genitals with negative inguinal glands should be searched for evidence of granuloma inguinale.

The cases should be watched for at least a year after treatment has brought about complete healing, as this will cut down the percentage of recurrences.

Experimental Observation on the Prophylaxis and Treatment of Syphilis (Henry Nichols and John Walker, *Journal of Experimental Medicine*, vol. xxxvii, No. 4).—By inoculating the scarified surface of both sides of the scrotum of rabbits with suspensions of *Treponema pallidum*, 100 per cent. of infections were obtained on one side or the other. Infection through the unbroken skin could not be produced.

By gland transfers from animals with positive local inoculations, 87.5 per cent. of takes were produced.

These two methods were used to test the prophylactic value of 30 per cent. calomel ointment. (a) Calomel ointment proved efficacious up to eight hours after inoculation with syphilis. (b) No marked difference appeared between the action of calomel in a base of lanolin and vaseline and in a base of benzoinated lard and wax. (c) Death from mercurial poisoning was produced in rabbits by a single application of a large amount of calomel ointment.

The method of gland transfers was used to test the sterilizing effect of arsphenamine and neoarsphenamine on old infections in the rabbit. The infection was completely abolished in every instance, whether by one, two, or four intravenous doses.

Natural spirochaetosis of rabbits need not be a serious complicating factor in work on syphilis in rabbits for the following reasons: (a) In natural spirochaetosis, the lesions occur on the penis and not on the scrotum. Gland transfers are negative. (b) A scrotal lesion can be produced by inoculation, but it can be distinguished from that of *T. pallidum* infection by its course. (c) In studies of generalized syphilis supposed to involve the genitalia, and in sexual transmission experiments, *T. cuniculi* may be a serious complicating factor.

A Quantitative Study defining a Point of Break-down of Hookworm Eggs cultured in Faeces and its Association with Intense Acidity (Norman R. Stoll,

American Journal of Hygiene, vol. iii, No. 2, March, 1923).—Experimentation detailed in this report demonstrates a method of analysing hookworm culture conditions by combining the use of an egg count method before (and during) the culturing and the larval isolation procedure afterwards.

Two experiments are described in detail in which very acid faeces are cultured for hookworm larvae under a variety of conditions.

The unmodified faeces produced few or no larvae. This was accompanied by an intense acidity at all stages of the experiment, as measured in terms of either the hydrogen ion concentration or the titration values. In general the pH reading was 4.8 to 5.0, the faeces titrating over 1 c.c. of decinormal sodium hydroxide per gramme.

Charcoal and soil cultures from the same stirred stools reared up to 69 per cent. of larvae.

The Relation between the Number of Eggs found in Human Faeces and the Number of Hookworms in the Host (Norman R. Stoll, *American Journal of Hygiene*, vol. iii, No. 2, March, 1923).—An intensive study of ten hookworm cases in Utuado, P.R., is reported in which the total number of hookworm eggs in the faeces has been computed for from one to five days and compared to worm counts on the patients after treatment.

The worm counts ranged from 37 to 1,163 *N. americanus*. Of the total of 4,704 hookworms expelled, 51 per cent. were females.

The cases ranged in egg output per day from 187,000 to 5,059,420.

The average egg output per day per female worm, based on all cases, was approximately 9,000.

The ratio of the count per gramme of excrement varied from forty-four eggs per gramme per female worm on formed faeces, to twenty-five eggs per female on mushy stools, to twelve eggs per gramme per female on diarrhoeic stools.

The total grammes output of faeces, per day of the three types in Porto Rico were in the same ratio, inversely as the number of eggs per gramme per female worm, based on the three kinds of excrement.

The consistency of the data presented is such as to recommend the use of a dilution egg-counting method to determine intensity of infections of patients with hookworms.

Clinical Experience with Quinidin (C. S. Burwell and F. R. Dieuaide, *Archives of Internal Medicine*, vol. xxxi, No. 4, April, 1923).—The authors' observations of the patients' activity, systolic blood-pressure, vital capacity, and subjective condition show a consistent improvement in all patients whose cardiac rhythm became regular and remained so for some time. Therefore, in patients with auricular fibrillation who cannot be brought to a satisfactory degree of circulatory efficiency by the usual therapeutic measures, an attempt to cause reversion to normal mechanism by quinidin is

justified by the hope that the patient's health will be improved thereby. It is well established that the change in rhythm can be effected in at least 50 per cent. of the cases.

Two grm. of quinin sulphate may be administered daily without the production of severe toxic symptoms, and such a dosage results in a higher percentage of successes than does a smaller dose.

So far as is known at present, the danger associated with the use of this drug lies not in its direct effects, but in embolism from an intra-auricular thrombus, following the onset of normal auricular activity.

Further Observations on the Use of a High Fat Diet in the Treatment of Diabetes mellitus (L. H. Newburgh and Phil L. Marsh, *Archives of Internal Medicine*, vol. xxxi, No. 4, April, 1923).—A diet of 900 calories derived chiefly from fat produces the same fall in basal metabolic rate as does fasting. It has advantages over fasting in that it is more successful in desugarization, and is a far less dangerous method.

A low protein, low carbohydrate, high fat maintenance diet fed a large group of diabetic patients since March 1, 1918, maintained an aglycosuric state; was not attended by acidosis; maintained nitrogen balance; did not cause a hyperlipoidemia, and was attended by its disappearance in those patients in whom it was present at entrance, supplied sufficient energy to avoid the evils of undernutrition and to permit an amount of activity compatible with earning a livelihood; and was, within the limits of observation, not attended by downward progress in uncomplicated cases.

Development of Protection after Prophylactic Inoculation (W. E. Harvey and K. R. K. Iyengar, *Indian Journal of Medical Research*, vol. x, No. 4, April, 1923).—No evidence of protection is manifest seven days after with a single dose of prophylactic antigen.

Development of immunity is significantly manifest very quickly after the administration of a second dose of prophylactic antigen.

Development of immunity reaches its maximum about the fourteenth day after the administration of a second dose of the antigen, and remains at its maximum up to at least the thirtieth day.

The curves showing rise, maximum, maintenance and fall must be of very different type for agglutinin production and immunity production.

The Pathogenicity of Insect Flagellates to Vertebrates, with Special Reference to Herpetomonas ctenocephali, Pantham (H. E. Shortt, *Indian Journal of Medical Research*, vol. x, No. 4, April, 1923).—The question of infection of vertebrates by natural insect flagellates requires further study by modern cultural methods before it can be accepted as definite fact.

The strains of *Herpetomonas ctenocephali*, Pantham, and *H. luciliae*, Strickland, used in this series of experiments proved non-infective to vertebrates in over fifty experiments.

The Prediction of Malaria Epidemics (C. A. Gill, *Indian Journal of Medical Research*, vol. x, No. 4, April, 1923).—The forecast regarding the occurrence of epidemic malaria in the Punjab, based upon data available at the end of August, 1921, accurately appraised the general incidence of "fever" mortality during the following October and November.

The malaria forecast foreshadowed with considerable, though not absolute, precision the distribution and relative severity of the epidemic in different parts of the province.

The degree of accuracy attained by the malaria forecast in 1921 encourages the hope that further investigation will render future forecasts even more reliable.

The preparation of forecasts in regard to the occurrence of epidemics of malaria in the Punjab is calculated at the present time to be of practical value to the civil and military medical authorities of this Province.

The Intestinal Flora in Mouse Typhoid Infection (Leslie T. Webster, *Journal of Experimental Medicine*, vol. xxxvii, No. 1, January, 1923).—The normal flora of laboratory mice at the Rockefeller Institute, fed on a bread and milk diet, was determined. *Bacillus acidophilus* and *B. bifidus* outnumber the *B. coli*, *B. acidi lactici* and *B. coli communior* group about twenty-five to one. White and yellow cocci which may or may not liquefy gelatine are occasionally noted; spirochætal and vibrio forms and yeasts are usually seen in stained preparations. This flora does not change when mice are artificially infected *per os* with a strain of mouse typhoid bacilli (*B. pestis caviæ*), and is the same in the animals which resist the infection as in those which succumb.

Mice fed on a meat diet and showing a colon, *B. diffluentis* and *B. welchii* flora do not differ in susceptibility to mouse typhoid from the normal mice fed on bread and milk and showing the above *acidophilus* flora.

An Intracutaneous Test for the Virulence of Diphtheria Bacilli in Field Cultures (J. N. Force and M. I. Beattie, *American Journal of Hygiene*, vol. ii, No. 5, September, 1922).—The literature on methods of performing virulent tests of *B. diphtheriæ* and on the results of such tests is reviewed.

A method for testing the virulence of *B. diphtheriæ* by means of the intracutaneous inoculation of guinea-pigs with field cultures is described.

Virulent tests, made by this method on cultures of *B. diphtheriæ* from various sources, are compared with tests of the same cultures made by the subcutaneous method described by Wayson.

It is demonstrated that the intracutaneous virulence test with field cultures is less often influenced by contaminating organisms than the subcutaneous test with field cultures.

It is further shown that the occasional difficulties of interpretation of the intracutaneous test, due to contaminating organisms, are negligible, when compared with the saving in time and animals made possible by the intracutaneous inoculation of field instead of pure cultures.

The results of virulence tests made with field cultures from various sources are compared with the results of virulence tests with pure cultures from similar sources.

The more extensive use of the virulence test in the administrative control of diphtheria is discussed, especially with reference to the prevention of loss of school time by children who may be carriers of avirulent diphtheria bacilli.

Experimental Anti-Tuberculous Vaccination of the Rabbit and the Guinea-pig (A. Calmette, L. Negre, A. Boquet, *Annales de l'Institut Pasteur*, September, 1922).—The rabbit and guinea-pig, when inoculated with the avirulent and non-tuberculous biliary (biliary) bacilli, are temporarily immune from virulent infections which prove fatal to controls. This immunity appears to cease in the rabbit after the sixth month, and in the guinea-pig about the fifth month after vaccinal inoculation.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE, January 10, 1923.

Study of Rabies in Senegal (P. Remlinger, M. Leger, Teppaz).—The results are given of experiments carried out on rabbits with virus taken from France. While the fixed virus of the Pasteur Institute of Paris is invariably fatal to rabbits in ten to twelve days, the same virus tested in Senegal caused death seventeen to fifty-five days after subdural inoculation. In Morocco the virus acts the same as in France, and the same virus from Morocco is identical in its effects in Senegal as in Morocco.

Bovine Theileriosis in Algeria (A. Donatien, E. Plantureux, P. Rossi, G. Esperandieu).—Parasite forms have been found by the authors in cattle suffering from coast fever in Algeria, which, by their morphological characteristics and by the results of experimental reproduction of the disease, have been identified as *Theileria parva*.

On a Leishmaniform Parasite in the Blood of a Blackbird, and on Trypanosomes of the Swallow (G. Franchini).—This is the first time that a leishmaniform parasite has been found in the blood of a bird; the parasite in this case had one nucleus and centrosome.

Parasites found in certain swallows have been named by the author *Trypanosoma cypseli* and *T. cotylei*.

Estrus oris in Ruanda (W. Africa) (René Van Saeceghern).—Large larvæ of *Estrus* genus with black and white rings have been discovered by the author in sheep of Ruanda. On one occasion two larvæ were found deep in the bronchi.

A Culture of Leishmaniform Parasites obtained in the Mouse by Inoculation of the Stools of the Louse (E. Roubaud and G. Franchini).—Blood taken from the heart of a mouse previously inoculated with the dried stools of a louse of *Ctenopsylla musculi* genus was sown in N.N.N. media; about three months later abundant cultures were obtained. Inoculation of two mice and a rat with the culture produced numerous leishmaniform parasites and caused the death of the rat.

Phlebotomus perniciosus Newst. in the Neighbourhood of the Oise (F. Larroussie).—The characteristics are given of a female phlebotomus identified as *Phlebotomus perniciosus*; the parasite was caught in the act of sucking the arm of an inhabitant of Savignies by M. Joyeux, August 15, 1921. The case is peculiar in that the larva lived on daily hæmatophagia, which till now has only been observed in *P. papatasi*.

A New Site for Bilharziosis in Tunisia (E. Gobert and C. Anderson).—Seven cases of vesical bilharziosis were recently observed at Kairouan; the patients were all males 12 to 18 years of age. The authors attribute the cause of the disease to *Bullinus contortus*, abundant molluscs of this genus being found in pools and river basins.

On the Subject of the Elimination of Quinine administered in the Form of Compressed Tablets (E. Sergent, H. Foley and A. Catanei).—Quinine in the form of comfits, consisting of 0.2 gm. of chlorhydrate, or of sulphate of quinine, and covered with 0.3 gm. of sugar, have always given good results in Algeria. The reaction in the urine is appreciable from the second to the twenty-sixth hour after ingestion.

Relationship of different Piroplasma (E. Sergent).—The study of a group of bovine infections at the Pasteur Institute in Algeria has led to the conclusions (1) that the infections are carried by ticks, (2) that in most cases there are probably a number different infections associated together.

The author is of the opinion that *Piroplasmum annulatum*, described by Dschunkowsky and Luks, should be classed as of the *mutans* type, as, although resembling *T. parva* morphologically, it was found to be transmissible by blood inoculation.

Piroplasmas in Indo-China (H. Schein).—The author, contrary to the opinion of M. Legerange (*Bulletin*, May 10, 1922), concludes that the bigeminate forms found in the calf and buffalo respectively are different species. The name *Piroplasma bubali* is suggested for the forms found

in the buffalo. The different piroplasmæ are described and illustrated.

*The Action of the Latex of Euphorbia Plants on different Trypanosomes. Cultures of Flagellates in different Latex (G. Franchini).—*The author has successfully carried out experiments showing the resistance of trypanosomes in the presence of the latex of *Euphorbia*, and also in the presence of physiological solution and citrated solution. The trypanosomes live longer, *in vitro*, in contact with the latex of *Euphorbia* than with either of the solutions.

Trypanosoma lewisi retains its vitality the longest, then follow *T. gambiense*, *T. evansi* and *T. soudanensi*.

The same species of trypanosoma and other flagellates cultivated in the latex of different plants gave the following results:—

Herpertomonas pyrithocoridis grows abundantly in nearly all latex experimented with.

H. chamoelonis grows in latex of *Euphorbia*.

H. ctenocephali gave negative results.

Cultures were obtained of *H. tarentola* and Oriental sore in the latex of *Elaeophorbia drupifera*. *T. lewisi* grows in several latex.

The parasites when sown often show pronounced changes in morphology.

The Virulence of Plague Strains isolated from Healthy Human Carriers (M. Leger and A. Baur).

—The authors state that in the indemnity of plague man must be added to the known reservoirs of supply of virus constituted by the *Muridia* and *Musaraigina*.

The authors have obtained Yersin bacilli from the glands of healthy inhabitants of Dakar who had been in contact with plague, but who did not present any morbid symptoms other than swollen painless inguinal glands such as are common to most North Africans.

*Cholesteranica among Lepers (Boulay and M. Leger).—*The four cases of leprosy recently reported upon as regards calcium and phosphorus metabolism have been investigated with reference to the quantity of cholesterol present in the serum. The quantities found ranged from 0.83 grm. to 1.10 grm. per litre. The normal quantity in a healthy person is about 1.60 grm. Injection of the ethylic ethers of chaulmoogra oil caused a notable increase in the cholesterol content to 1.80 and 1.47 in the two cases where there was calcium retention, but made little difference in a case where there was marked decalcification.

*Piroplasmas of the Genus Gonderia mutans in Bovines in Senegal (M. Leger and E. Bedier).—*A bullock about two years old, which died after being under observation for fifteen days, was found to be infected with over 200 ticks of the genus *Amblyomma variegatum* and *Hyalomma aegyptium*. The hamatozoa found were of diverse forms; two forms 4.5 microns long and 2.50 microns large could be seen differing in characteristics from the others.

*Evaluation of the Quantity of Blood passed with the Urine in a Case of Vesical Bilharziosis (Boulay and M. Leger).—*Study of a case at Dakar has shown a passage of 57.86 grm. of blood per litre, amounting to a total loss of 175 grm. in twenty-four hours.

Medical News.

SIR WILLIAM SIMPSON, C.M.G.

A PUBLIC servant of unique value has been honoured by the King and created a Knight. He has been well known under the name of William John Ritchie Simpson in many parts of the world. He is now Professor Sir William Simpson, C.M.G. His public career commenced when he took up the post of Medical Officer of Health in the city of Aberdeen and Lecturer in Hygiene in the University. Sir William next held the honourable position of Medical Officer of Health in the city of Calcutta from 1886 to 1897, and on his retirement from that responsible position he was appointed Professor of Hygiene in King's College, London. He was one of the pioneers of the London School of Tropical Medicine and Hygiene, and Lecturer in the School on his own subject. Of his multitude of important works and travels, we may mention that he was a member of the Government Commission to inquire into dysentery and enteria in South Africa, 1900-1901; is a member of Naval Medical Consultative Board and of Medical Sanitary Advisory Committee for Tropical Africa. He was appointed Government Commissioner to inquire into causes of plague in Hong-Kong, 1902, and to report on sanitary conditions of Singapore, 1906, on sanitation in West African Colonies, 1909, and in East African Colonies in 1913.

Sir William has been the author of several medical publications: "Treatise on Plague," 1905, "Principles of Tropical Hygiene," 1909, and his researches in vaccine are regarded as a piece of truly scientific work.

His travels have been widespread, his writings are masterpieces of lucidity, classical in their language and interpretation and historical records of importance. Respected by all, loved by many friends, and congratulated by every member of the medical profession on the knighthood he has so well deserved and honours.

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Original Communications.

DISCOVERY OF A NEW TYPE OF GERM ISOLATED FROM CASES OF MEASLES AND SCARLET FEVER (MINUTE GRAM-NEGATIVE ANAEROBIC DIPLOCOCCUS).

by DAVID THOMSON, O.B.E., M.B., Ch.B. Edin., D.P.H. Camb.
Honorary Director of the Pickett-Thomson Research Laboratory, St. Paul's Hospital, London.

DISCOVERY OF MINUTE GRAM-NEGATIVE DIPLOCOCCUS.

In the early part of this year the author commenced a research into the cause of measles and scarlet fever, using two new types of anaerobic culture media. One medium consisted of a fluid testicular extract containing testicular mince, and the other was a mixture of soft agar and whole human blood such as has been recently used in the cultivation of spirochaetes.

The tubes were sent to Dr. Clegg at the City Fever Hospital, Newcastle-on-Tyne, who very kindly undertook to inoculate them from swabs taken from the throats of measles and scarlet fever cases. These inoculated tubes were incubated at blood heat for twenty-four hours at the Fever Hospital, and then dispatched to the Pickett-Thomson laboratory, where they were incubated for a further period and carefully examined day by day.

In the inoculated tubes containing the testicular mince it was apparent that, amongst a variety of organisms usually found in catarrhal affections of the nasopharynx, there were also present minute gram-negative diplococci which tended to be grouped in masses. This latter organism might be mistaken for the *Micrococcus catarrhalis*, except that it is very much smaller in size. As this minute diplococcus appeared to be an unusual organism these mixed cultures were plated out on the best varieties of media, such as human plasma agar, hydrocele agar, testicular extract agar and whole blood agar, but in no case could it be detected on the plates. Similar plate cultures were then placed in strict anaerobic conditions, and the presence of the small Gram-negative diplococcus once again became evident. The colonies of this germ, however, were so small that it was only isolated in pure culture with great difficulty after many attempts. The germ was isolated pure, first from one of the measles cultures, and later from one of the scarlet fever cultures. It was present, however, in all of them.

CHARACTERISTICS OF THE NEW DIPLOCOCCUS.

Having isolated the germ in pure culture, the following unusual characteristics were soon brought to light:—

- (1) It is a strict anaerobe, and will not grow on the very finest culture media in ordinary aerobic conditions.
- (2) It will not grow on ordinary nutrient agar in anaerobic conditions.

(3) It requires, therefore, for its growth media containing plasma, whole blood, hydrocele fluid, or testicular extract.

(4) On these latter culture media in anaerobic conditions it only grows with great delicacy, and the colonies are exceedingly minute, varying from about 0.2 to 1 mm. in diameter.

(5) The colonies are almost transparent like minute droplets of moisture and tend to have a faintly yellowish tinge.

(6) The germ is a remarkable gas producer. It produces abundant effervescence in the testicular broth, and this explains why in several of the tubes the rubber bungs were blown out in transit. In shake cultures it was found to produce abundant gas in testicular agar, plasma agar and hydrocele agar, to which no sugar is added. These media evidently contain sufficient natural sugar to cause the production of gas, and the culture medium becomes markedly acid.

(7) The germ is a true diplococcus, growing in pairs like the gonococcus, but it is extraordinarily minute, measuring only about one-third of the diameter of the gonococcus, or about 0.3 micron.

(8) In liquid media it tends to grow in masses and never in chains.

(9) It is markedly Gram-negative like the gonococcus.

(10) It appears to ferment most sugars. In Hiss's horse serum water it fermented glucose, lactose, maltose, saccharose, dextrin, inulin, mannite and glycerol, producing acid but no gas. It is likely that no evident gas was produced because the growth was extremely weak, as the horse serum did not seem to make a good medium.

(11) It is extremely soluble in weak alkali, thereby resembling the gonococcus, the meningococcus and Pfeiffer's bacillus.

IS THE DIPLOCOCCUS ISOLATED FROM THE MEASLES CASE THE SAME AS THAT FROM THE SCARLET FEVER CASE?

The two cultures appeared in every respect identical, and no marked difference could be detected in the colonies under the low powers of the microscope. The characteristics described above were common to both organisms. One difference, however, was detected—namely, that in fluid cultures the germ from the scarlet fever case formed large clumps, and when shaken up appeared in the flocculent masses. On the other hand, that from the measles did not tend to clump but formed when shaken a fine uniform emulsion. Though very closely allied it is evident, therefore, that the two germs are not identical. Although this variety of organism has been found microscopically in the throat smears and in the testicular-minced cultures from all cases of scarlet fever and measles, yet in a period of two months the author has only been able to isolate three strains pure, viz., two from measles cases and one from a scarlet fever case. So far the two strains isolated from the measles patients agree in not producing flocculent masses in testicular

broth, thereby differing from the scarlet fever strain.

ARE THESE GERMS THE CAUSE OF MEASLES AND SCARLET FEVER?

The author is very sceptical on this point, but keeps an open mind pending further researches on the matter.

The following facts may be considered against the view that they are the causal organisms of these diseases:—

(1) They could not be cultured from the blood of one case of measles and three cases of scarlet fever taken during the commencement of the rash stage.

(2) They do not pass through a sound Berkefeld filter.

(3) They appear to be present occasionally in testicular-mince cultures inoculated from the sputum of normal persons not suffering from these diseases. At any rate, similar tiny Gram-negative diplococci can be seen in some of these cultures, though so far the author has been unable to isolate a single strain from persons not suffering from measles or scarlet fever.

(4) A rabbit fed on a piece of bread soaked with the pure culture from scarlet fever showed no ill-effects.

In spite, however, of the above facts, it cannot yet be stated definitely that the germs are not the causal organisms of these diseases. From the nasopharynx of many persons in perfect health can be isolated pneumococci, streptococci, Pfeiffer's bacillus and *M. catarrhalis*, yet these micro-organisms are pathogenic and can cause fevers. Many people carry the germs of diphtheria, typhoid fever and malaria, and are apparently more or less immune and quite healthy. It is just possible, therefore, that the minute diplococcus described above may at certain seasons become virulent and cause epidemics of measles and scarlet fever amongst non-immune children, whereas the adult population harbour the germ but take no harm from it.

A rabbit which was fed on a pure culture of the diplococcus from the measles case developed after the second day a definite cornea condition, with running at the nose, sneezing and definite discharge from the eyes. The diplococcus was found in the discharge from its nose. This rabbit was somewhat ill and uncomfortable for two days, but recovered very rapidly.

Finally, this minute diplococcus is usually seen in fair abundance in Gram-stained smears of the mucus from the throats of measles and scarlet fever cases, whereas it is not at all evident in similar preparations from the throats of normal adults. On the other hand, in the inflamed nasopharynx of measles and scarlet fever patients all the other organisms, such as *M. catarrhalis*, Pfeiffer's bacillus and streptococci, are also much more abundant than in normal persons.

Should these new organisms, which apparently have not hitherto been isolated or described, prove not to be the cause of measles or scarlet fever,

nevertheless it is likely that they will be found to play some important part in the catarrhal affection of the respiratory tract, more especially as they show in certain characteristics a striking resemblance to the gonococcus and the meningococcus. They resemble, moreover, in certain characters the recently discovered germ *Bacterium pneumosintes* which has been described as the cause of epidemic influenza. The writer regrets that this research so far incomplete, but owing to the great difficulty of isolating many strains of this new diplococcus it is necessary that many other workers should co-operate in the combined attempt to clear up the problem, which may prove to be of considerable importance.

The author in closing would like to express his sincere thanks to Dr. Sandilands and to Dr. Cleghorn of the City Fever Hospital, Newcastle, also to his colleague, Dr. Robert Thomson, and to his assistants, Mr. E. S. Dean and Mr. F. Downing for their skilled co-operation in this research.

He is also indebted to Dr. Goodall and Dr. Morrison of the North Western Fever Hospital, Hampstead, for the supply of further material.

EXPLANATION OF PLATE.

FIG. 1.—Photomicrograph of Gram-stained smear of pure culture of the minute diplococcus obtained from measles patient. Magnification 1,700 diameters.

FIG. 2.—Ditto, pure culture of minute diplococcus from scarlet fever case. Magnification 1,700 diameters.

FIG. 3.—Smear from gonococcus culture. Magnified 1,700 diameters. Note its large size compared with the diplococcus shown on figs. 1 and 2.

FIG. 4.—Colony of the Gram-negative diplococcus from measles, grown anaerobically on testicular extract agar. Magnified about 50 diameters.

FIG. 5.—Colony of the Gram-negative diplococcus from scarlet fever, grown anaerobically on testicular extract agar. Magnified about 50 diameters.

FIG. 6.—Colony of the gonococcus grown aerobically on human plasma agar. Magnified 30 diameters.

FIG. 7.—Colony of a Gram-negative aerobic diplococcus isolated recently by Dr. Broughton Alecock from a cervix grown on human plasma agar. Magnified about 40 diameters.

POSSIBLE HOSTS FOR THE BILHARZIAS IN PORTUGUESE EAST AFRICA.

By F. G. Cawston, M D Cantab.

It has been stated that bilharzia disease has been introduced into Portuguese India by persons labouring *Schistosomum hamatobium* and *S. mansoni* arriving from Mozambique. In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for October, 1922, I reported the presence of freshwater snail harbouring schistosomes in the water-lily pools at the zoological gardens at Lourenço Marques. Besides those which resembled the bilharziasis *Physopsis africana* and *Planorbis pfeifferi*, Dr. E. T. Faust has reported the presence of a large non-mammalian schistosome as well as the small parasite, *Cercaria oculata*, in the material I sent him. Although efforts to destroy mosquitoes have resulted in the death of freshwater snails and a fe

fish in these pools, in April last I was able to secure a number of examples of *P. africana*, *P. pfeifferi*, and the interesting *Isidora* I had found in this locality during my last visit. Numerous schistosomes were again present in water containing the *Physops* and *Isidora*; their total length was 0.8 mm., the head, tail and prongs being about equal in length. No eye-spots could be seen.

At Beira, tartar emetic injections in 1 per cent. solution are used in the treatment of bilharzia disease. The injections are given on alternate days for three weeks, which, however, in my experience is usually insufficient to produce a permanent cure. The majority of these patients reside inland. As the local intermediary hosts had not been determined, I visited the rice-fields in the Chinese quarter and the mangroves outside the town where water-lilies grow in profusion. It is possible that the occasional presence of brackish water in these swamps around Beira helps to keep down the number of freshwater snails, and, at the golf links, I could find only *Cerethidea decollata*, an operculated inhabitant of lagoons.

In the water-lily pools at the side of the roads I found numerous examples of *Lanistes orum* Peters, which I have also found at Lourenço Marques; but I found no cercariae in the water in which I had placed these operculated shells overnight. Attached to the water-lily leaves were also examples of *Isidora forskali*. Immature examples of an *Isidora* resembling *I. natalensis* and a shell apparently *Hippantia* were found in the same pools, but none were found in the rice-fields where domesticated duck are kept.

Along the north coast of Natal, *I. forskali* is sometimes infested with schistosomes resembling *S. hamatobium*, and these *Isidora* at Beira may also act as its intermediary host. As bilharzia disease is more common further inland, it is probable that more thorough search would reveal the presence of various fluke-infested species, and show that bathing in the rivers of Mozambique is as risky as bathing in the coastal rivers of Natal.

Schistosomes are only very occasionally encountered in *Isidora* in South Africa, their usual host being *P. africana*. Our commonest freshwater snail, *Limnaea natalensis*, is seldom infested with schistosomes of any kind; both Dr. Annie Porter¹ and myself have shown that, even in heavily infested pools, *L. natalensis* is usually free from schistosome infestation.

The presence of *P. africana* infested with schistosomes in Portuguese East Africa suggests that this may act as one of the intermediary hosts in Egypt, where it also occurs. The species has been described as a *Physa*. I have some *Physa* which Dr. S. B. Jones sent me from St. Kitts, B.W.I.

Referring to this West Indian species, Major M. Connolly observes: "*Physa* and *Isidora* are quite distinct. *Physa* belongs to the family *Phy-*

sida and *Isidora* to the *Planorbidae*. But this need not concern you in your African work, as nearly all African species from south of the Sahara are *Isidoras*; only two are *Physas*, and they are not South African."

As a prophylactic measure in this recent tour, I found rubber surgical gloves cheap and serviceable for handling the specimens, and, as an additional safeguard, on my return to Durban I gave myself an intravenous injection of $\frac{1}{2}$ gr. of tartar emetic.

RECTAL INJECTIONS OF QUININE.

By WILLIAM FLETCHER, M.D. Cantab.

Bacteriologist, Institute for Medical Research, Kuala Lumpur, F.M.S.

MOST medical men in the tropics have occasionally prescribed quinine in the form of an enema, but few of them have witnessed the results. If they happen to have seen the blood and mucus, which are the usual sequel to the injection, they have probably concluded that their patient's malaria was complicated by dysentery.

Rectal infections of quinine are recommended in most textbooks on tropical medicine. Daniels (1913) is their warmest advocate. He states that the results of quinine administered *per rectum* are quite as good as those which follow the intravenous or intramuscular injection of the drug. He recommends a dose of 20 gr., dissolved in a minimum of acid, and diluted up to 4 or 6 oz.

Castellani and Chalmers (1919) recommend that 20 gr. of the bihydrochloride should be made into a solution, with water, and given with an ounce of mucilage of starch solution.

Manson-Bahr (1921) states that quinine may be given by enema in those cases in which the symptoms are not severe enough to warrant the prolonged use of intramuscular injections. He says that it is readily absorbed if the bowel be not too irritable, and recommends that the dose should not be less than 30 gr.

S. P. James (1922) advocates the hydrochloride; double the dose which would be given by the mouth, dissolved in water and mixed with an ounce of starch and a few drops of opium.

MacGilechrist (1911) is the only English authority whom we have found openly condemning rectal injections of quinine. He states that they are irritating, quickly returned, and of little therapeutic value. He considers that if they are given at all, the best results are obtained by using quinine hydrochloride in a dilution of about 1 in 50 of water, with tincture of opium.

We have seen a number of disasters resulting from intramuscular inoculations of quinine, consequently we determined to treat a series of patients with rectal injections and to examine the urine, at short intervals, in order to determine if the drug is readily absorbed. It was our intention, should rectal injections prove as efficacious as intramuscular quinine, to advocate

¹ See the *South African Journal of Science*, December, 1922, vol. xix, pp. 64-94 and 277-279.

the former route; especially in places and on occasions where a skilled operator and an efficient syringe are not available.

Two patients were given, *per rectum*, 2 oz. of the same mixture of quinine hydrochloride which was being administered to other patients by the mouth. The strength of the solution was 15 gr. in 1 oz. of water. Three other men were given the same mixture diluted with an equal quantity of salt solution; i.e., 30 gr. of quinine in 4 oz. The solution was injected slowly through a rubber catheter. The effects were most shocking and striking. In the first two cases severe pain came on almost immediately and, within fifteen minutes, all five men were groaning, straining, and passing blood and mucus. One of the patients was so collapsed that he was wrapped in blankets and given stimulants. This man continued to pass blood and mucus for five days; the other four recovered in twenty-four to seventy-two hours.

Three other men were given 35 gr. of quinine bishydrochloride with starch and opium. The strength of the mixture was 9 gr. of quinine in 1 oz. The patients were unable to retain these injections for more than a short time. Within ten or fifteen minutes they were all passing mucous and membranous shreds, followed later by bloody mucus. One of them passed 1½ oz. of coagulated membrane mixed with mucus, within three hours.

A still weaker mixture was then employed. It contained quinine bishydrochloride 2 gr., starch 2 gr., tincture of opium 1½ minim in 1 oz. of water; 15 oz. of this was administered slowly, by irrigation, through a fine rubber catheter; but the patient was unable to retain it, and returned it, mixed with shreds of membrane and mucus, which he continued to pass from time to time for twenty-four hours.

The urine, in these cases, was examined at intervals for the presence of quinine, but it was not found in any of them.

These results demonstrate the uselessness of quinine given *per rectum*, and show what pain must have been suffered by numbers of children in the tropics to whom the drug has been administered by this route.

CONCLUSION.

Quinine is too irritating for administration *per rectum*, and it should not be given in this way when any other means are available.

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THE JOURNAL OF Tropical Medicine and Hygiene

JULY 2, 1923.

THE DEBT TO SIR RONALD ROSS

In the *Times* of June 22, 1923, a remarkable letter under the title *Tropical Diseases* appeared, acclaiming a proposed institute as a monument to Sir

PRESIDENT'S CHAIN AND BADGE.

THE
ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

Presented by

SIR JAMES CANTLIE, K.B.E., M.B., F.R.C.S., LL.D., M.A.,

June, 1923.

PATRICK MANSON, 1907-1909
WILLIAM LEISHMAN, 1911-1913
FLEMING SANDWITH, 1915-1917
WILLIAM SIMPSON, 1919-1921
PERCY BASSETT-SMITH, 1923

RONALD ROSS, 1909-1911
HAVELOCK CHARLES, 1913-1915
DAVID BRUCE, 1917-1919
JAMES CANTLIE, 1921-1923



Ronald Ross. The great discovery of the part played by the anopheline mosquito in the spread of malaria formulated by the late Patrick Manson, and proved by the patient labours and the scientific acumen of Ronald Ross, has been before the world for well-nigh a quarter of a century. The part played by Ross in this great drama of science was for the most part a practical one, and not the less wonderful in its material bearing. Without belittling the important work of Bignami, Grassi, MacCallum and others, it may be said that the four men chiefly concerned in this epoch-making discovery are: Laveran, who found the parasite of the disease; Golgi, who proved the plurality of species of the organism; Manson, who formulated the mosquito theory; and Ross, who worked out the chain of evidence to a practical issue. Each of them played a glorious part, and now that well-nigh a quarter of a century has but served to clench the truth of the whole story, it is meet that due recognition should be given to the last of those who crowned the investigation with success. Time was when malaria was unknown in many of the countries which subsequently developed the disease. From whence it sprang is unknown, but its encroachment has been traced from nation to nation and from continent to continent. In the lifetime of many now with us the rise and fall of the most widespread of all diseases has been watched, its inroad has been noted, as in 1866 in Mauritius, its disappearance has been observed, for in the British Isles ague in the seventies of last century still played an active part in the lower reaches of the Thames Valley, and especially from around Greenhithe in Kent, patients found their way to Guy's, Bartholomew's, St. Thomas's, and Charing Cross Hospitals in London. During the last half century the outbreaks have waned, until it may now be said to be extinct in the British Isles. A century ago, however, malaria was rife in the undrained portions of South-Eastern England and the Fen countries, and yet in still more remote times few parts of Britain were malaria-free. The disappearance gradually came about as the waterlogged soil of England was drained, so that the breeding places of anophelines were abolished. In Holland the same story holds good; but in Eastern and Southern Europe malaria still held sway, and every tropical country was and is scourged with malaria. The evils due to malaria or ague, as it was termed, were apparent. In Britain the population multiplied as malaria subsided. In the time of the Napoleonic wars the population of England numbered but some ten to fifteen millions; in the time of the Great War, 100 years later, the numbers rose with an England free of malaria, the numbers amounting to over forty millions. Its strength rose as malaria declined. In Greece in early times, whilst yet malaria-free, its strength physically and intellectually had attained its highest state of perfection, but when invaded by the parasite of malaria its powers waned until it gradually lost its prestige and fell before its aggressors; and similarly the decline and fall of the Roman Empire accords with the inroad of malaria.

Disease is the determining factor in the rise and fall of all States; as disease—in other words, malaria—advances or recedes, so do their armies conquer or fail. Parasites are worse than bayonets and healthy blood than when in armour clad. Ross and his teaching have done more to shape the world's history than guns or airships, and it is right that the paths of science should be honoured in one who has fought the deadly elements of disease.

The cry against yet another channel of research being instituted is unworthy of modern science. The Scriptural teaching to multiply and replenish the earth was never more in request than now, and it is to be hoped that the institute dedicated to Ross will be but a stimulus for many more of the kind being erected, so that science may flourish and disease recede.

J. CANTLIE.

PROPOSED INSTITUTE AS MONUMENT TO SIR RONALD ROSS.

(From the *Times*.)

The twenty-fifth anniversary of Sir Ronald Ross's epoch-making discovery of the transmission of malaria to human beings through the bite of the anopheline mosquito will shortly occur. This discovery has revolutionized medical science and living conditions throughout the Tropics. It has led to many parts of the world whose climates were formerly reputed to be fatal to Europeans and even indigenous races being disarmed of a large measure of their dangers and being rendered perfectly habitable, provided that reasonable precautions to avoid the assaults of mosquitoes are taken.

In the case of the Panama Canal—an engineering work of world-wide importance—the application of the knowledge acquired through Sir Ronald Ross's patient and exacting labours enabled General Gorgas so completely to stamp out malaria and yellow fever throughout an extensive area, that the imported labour forces, the enormous death-rate among which had frustrated all previous efforts, were able to carry out their work amid normal health conditions and to bring it to a triumphant conclusion. Here the elimination of the risk of the malarial infection was complete; but in many other parts of the Tropics, where local circumstances preclude the establishment of an equally rigid control, the danger has been reduced during the past quarter of a century in a remarkable degree; and it is not possible to exaggerate the value of the services which Ross has thus rendered to mankind, the number of the human lives that he has been instrumental in saving, the amount of suffering which he has spared to thousands. Moreover, the material benefits which he has conferred alike upon the inhabitants of the temperate and the torrid zones hardly admit of exaggeration, for he has helped to render comparatively safe lands which were formerly regarded as deadly, and thereby has stimulated their development and the production of raw materials which they yield, upon which Europe and America are increasingly dependent.

Such a record as this places Ross definitely in the ranks of the truly great investigators whose labours, like those of Pasteur, Lister, Jenner, and Golgi, have conferred inestimable and lasting benefits upon the human race.

All the world has shared in these benefits; but by Great Britain, which, as the possessor of vaster areas in the Tropics than have ever before been ruled by a single sceptre, has profited more abundantly than any other country, a very special debt of gratitude is due to the son who has rendered to her and to the millions under her government and protection this incalculable service.

It is felt by us, and we believe by many others whose interests are mainly centred in the Tropics and in their civilization and development, that the occasion of the 25th anniversary of Ross's discovery should not be suffered to pass by without some fitting monument to his achievement being erected in London, the heart of the Empire, that may be a public recognition of his services while he is still among us and a lasting memorial to him after his death.

There is in process of organization the nucleus of an institute, which it is suggested should be called the "Ronald Ross Clinique for Tropical Diseases and Hygiene," in which it is proposed that laboratory research and clinical investigations should be combined as closely as possible in accordance with his teaching. There already exist in this country two Schools of Tropical Medicine, one situated in London and one in Liverpool, both of which have rendered most valuable services to the cause of combating tropical diseases. Their activities, however, are in the main directed to educational work, for training young medical men for practising in the Tropics. It is proposed that the institute should supplement and in no way compete with these Schools of Tropical Medicine; that its primary object should be research, and not teaching; that a clinical establishment should be maintained in intimate conjunction with its laboratories; and that in it Ross—a master mind—assisted by other experts in medical science, should have the fullest scope for the initiation and continuation of researches into the still unsolved problems of tropical medicine and hygiene.

There is a Pasteur Institute in Paris; a Kitasato Institute in Japan; a Gorgas Institute at Panama; and it is strongly felt that Great Britain should honour one of her greatest investigators by the establishment of a Ross Institute in London. To initiate the Ross Institute £50,000 is required. Cheques should be made payable to the Ross Clinique and sent to the honorary treasurer, Lord Willoughby de Broke, 56, Queen Anne-street, W.1, or direct to the manager of the Westminster Bank, 1, Stratford-place, Oxford-street, W.1.

Yours faithfully,

H. H. ASQUITH.

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DORABJI J. TATA.

WARING.

WILLIAM H. WELCH (Director, School of Hygiene, Johns Hopkins University, Baltimore, U.S.A.).

ALFRED YARROW.

A ROSS INSTITUTE.

We publish to-day a letter in which the proposal is set forth to establish in London a Ronald Ross Institute of Research in Tropical Diseases. The list of signatories includes the names of men greatly distinguished in many departments of activity and constitutes of itself a proof that Sir Ronald Ross's services have laid most of the departments of our life as an Empire under tribute. Nor has the benefit been confined to ourselves. The letter is signed by the Directors of the Pasteur Institutes of Paris and Brussels and by the Director-General of the Public Health Service of the United States. Every country, indeed, possessing tropical possessions has made use of Ross's great discovery of the transmission of malaria by the anopheline mosquito, the most conspicuous recent monument to which is the Panama Canal. "There is," the

letter declares, "a Pasteur Institute in Paris; a Kitasato Institute in Japan; a Gorgas Institute at Panama." These foundations have already proved their usefulness; nor is the enthusiasm which the names associated with them inspire the least part of their value. Sir Ronald Ross's experience as a research worker and his great knowledge of the problems of tropical medicine which still await solution are national assets. An institute bearing his name and under his control and guidance must therefore, we believe, serve a national purpose both in the present and in succeeding generations. Such an institute, as we are assured, will in no way compete with the work now being accomplished at the Schools of Tropical Medicine in London and Liverpool. These bodies are engaged for the most part in the education of young graduates; the aim of the new foundation will be research alone.

Annotations.

Ulcus Epidemicum (Walter B. Adams, *Archives of Dermatology and Syphilology*, vol. vii, No. 5, May, 1923).—Tropical and epidemic ulcers are terms loosely and vaguely used. An epidemic of ulcers, frequently called "tropical," began in Syria in 1916, swept through the land, reached its height in 1919, and now seems to be gradually disappearing.

It is a dry weather disease, flourishing during the summer drought and never beginning in the rainy season.

The painful obstinate ulcers invariably occur on the exposed parts of the poorer people of the community.

The aetiology seems to be a fusiform bacillus and a commensal spirillum found in the edges; but a rich flora flourishes on the floor of the ulcers.

The host, if there be one other than man, is unknown, as is the carrier.

The treatment calls for prompt and energetic measures; but at best the healing is slow.

The painful ulcers incapacitate patients for work for a long time, thus causing a serious loss to the community.

The term epidemic ulcer is suggested as appropriate for the lesion.

Investigations concerning Yaws (A. W. Sellards, E. W. Goodpasture and W. de Leon, *Philippine Journal of Science*, vol. xxii, No. 3, March, 1923).—The Wassermann test was strongly positive in 100 per cent. of forty-five patients presenting active cutaneous lesions of yaws.

Complement binding strength of titrated serum from yaws is equal to the maximum strength of syphilitic serum.

Following the clinical cure of yaws by intravenous injection of neosalvarsan the Wassermann reaction remained positive for many months, gradually

weakened, and became negative in seven out of twelve cases within six months after treatment.

Treatment of yaws in the early secondary stage with mercury caused no noticeable improvement in the lesions. The Wassermann reaction showed an initial slight weakening in the titre, then remained constant and strongly positive.

An antigen prepared from an early yaw containing treponemata did not fix complement with sera from yaws patients that were strongly positive with the usual cholesterinized antigen.

The Influence of Calcium Chloride upon Experimental Botulism (Ivan C. Hall and Nelson C. Davis, *Journal of Experimental Medicine*, vol. xxxvii, No. 4, April, 1923).—Calcium chloride given subcutaneously, intraperitoneally, or intravenously has been found to have no effect upon the production of botulism following the injection of *Bacillus botulinus* (Strain 80B) into the peritoneal cavity of guinea-pigs.

Treatment of *B. botulinus* with alcohol has been found markedly to decrease its toxicity for guinea-pigs. This is in conformity with the work of Bronfenbrenner and Schlesinger.

Toxin-free spores of *B. botulinus* have been found pathogenic for guinea-pigs.

Immunity to Yaws (A. W. Sellards and E. W. Goodpasture, *Philippine Journal of Science*, vol. xxii, No. 3, March, 1923).—A patient, in the well-developed secondary stage of yaws, was successfully reinoculated with yaws; the lesion soon regressed spontaneously.

Two patients in the stage of clavos were reinoculated with yaws. The lesions that developed disappeared very rapidly.

The reinoculation of untreated patients suggests that a long-standing infection with yaws produces a definite though not complete resistance to reinfection.

Four patients in the secondary stage of yaws were treated with neosalvarsan and reinoculated with yaws several months later. In one a typical granuloma was produced; in the other three atypical reactions resulted.

The results of reinoculation of patients cured with neosalvarsan indicate the development of a measurable degree of active immunity in yaws.

No evidence was obtained to suggest that the serum of yaws cases under treatment with neosalvarsan has any curative action when injected in yaws patients.

Aspergillus in Scalp Lesions following Red-Bug (Leptus) Bites (Kenneth M. Lynch, *Archives of Dermatology and Syphilology*, vol. vii, No. 5, May, 1923).—Bites from red-bugs cause rounded urticarial wheals to appear which increase in size and produce itching on being scratched. *Leptus* does not actually burrow in the skin, but often becomes embedded at

the root of a hair or within the swelling which occurs around it. It may be difficult to move, and sometimes it is necessary to use a fine-pointed instrument to dislodge it. Ordinarily, if the bite is not scratched, the lesion causes no trouble and disappears in two or three days. From scratching, however, and especially when the bug remains embedded, a considerable sore may result, probably from secondary infection.

The more serious lesions resulting from these bites occur on the scalp. The primary lesion is not different from that on the other parts of the body, but not infrequently it has superimposed a condition which has been confusing and which is sometimes most disagreeable. This lesion consists of a conical or columnar accumulation of hard lumpy yellowish-brown crusts, through which the hairs run and become embedded, piled on a low elevation of the skin with more or less surface abrasion.

Removal of the accumulation of exudate reveals the skin lesion on which the lump of yellowish-brown crusts form again, piling up until elevations of a quarter of an inch high may occur. On account of the fact that the condition appeared to be a secondary infection grafted on the "red-bug" bite by scratching, fostered by the favourable location in the scalp, and also on account of the suggestive character of the lesion with its piling up of yellowish-brown crusts, which would reform when moved, the hairs and crusts from the sores were examined for fungi. Fresh preparations, made in 10 per cent. sodium hydrate and allowed to stand for a sufficient length of time to clear the material, revealed no infection of the hairs, but from the scabs appeared numbers of peculiar mycelia-like and spore-like bodies. Investigations proved the fungus to be *Aspergillus fumigatus*, which is a common saprophyte and has been found parasitic in lungs, ears and other parts of the human body and in wounds. These findings appear to have justified the suspicion that a fungus is responsible for the continuation of the sore at the "red-bug" bite and for the change in the character of the lesion, as well as for its spreading.

Treatment consisted of removing the masses of exudate and applying sulphur ointment twice daily on the elevated and eroded area. A few small yellowish masses reformed but were easily removed, and in a few days no further formation occurred. The skin lesion gradually disappeared in the course of ten days or two weeks.

The Histology of Healing Yaws. (Ernest W. Goodpasture, *Philippine Journal of Science*, vol. xxii, No. 3, March, 1923).—Castellani's *Treponema pertenue* has been demonstrated by Levaditi's method in abundance in early yaws, not only within the thickened epidermis but also within perivascular connective tissue of the papillae.

The lesions studied indicate that the secondary yaw begins with a localization of treponemata, from the blood, in certain papillae, and from such points the organisms infect the epidermis, where conditions become more favourable for their growth.

Within forty hours after the injection of a therapeutic dose of neosalvarsan all treponemata demonstrable by Levaditi's method had disappeared from early yaws.

The remarkably rapid healing of secondary cutaneous lesions after injection of neosalvarsan consists essentially in an almost immediate suppression of acute exudation, and the removal of excessive fluid and cellular exudate by surface evaporation, by absorption, and by phagocytosis. The thickened epidermis quickly resumes normal differentiation with hyperkeratosis for a while until the epithelial layer becomes again of a normal width and rapidity of growth.

It seems probable that neosalvarsan is destructive of polymorphonuclear leucocytes in the lesions, and this may favour the rapid disintegration of treponemata.

The older secondary nodular lesions have a more permanent architecture, heal less rapidly, and probably offer greater protection to treponemata; consequently, they require more care in effecting a complete cure.

Abstracts and Reprints.

MEDICAL REPORT OF THE TAINAN HOSPITAL. ENGLISH PRESBYTERIAN MISSION, FORMOSA, 1920-1922.

By D. JAMES MAXWELL.

It has been interesting in recommencing work out in Formosa to compare the nature of the cases with those of earlier years. Malaria, dysentery, and tuberculosis of every form covered the bulk of the medical cases in those days. To these must now be added ankylostomiasis. The incidence of the latter is not probably larger than in earlier years, but twenty years ago so little was known of its diagnosis and still less of its importance. Now the stools of all in-patients—over 2,000 a year—are examined on admission to the hospital, with the result that the infection rate is found to be nearly 49 per cent. Not by any means all of these suffering from ankylostomiasis, but the numbers now treated for the disease in the hospital makes it one of the main items on the medical side. All the drugs commonly used have been tried, only to recognize in each case the drawbacks consequent on the sequelae that occasionally follow the exhibition of these poisons. The latest is that with carbon tetrachloride, and it is hoped that a favourable report of this will be forthcoming.

Naturally in a country like this *Ascaris* is a universal infection, and were it only possible to get hold of the men who have driven the price of saunterin up to its present preposterous figure something like murder would be done. At present the price paid is some 2,000 per cent. more than was

paid a few years ago, and the amount of unnecessary suffering that the cost of the drug entails on a people who can hardly afford the price of a single dose is incalculable.

Syphilis and leprosy are two more of the diseases that are terribly common here. Their incidence has not appreciably varied among the hospital patients. On the average about 100 intravenous injections of neokarsivan are given per annum, and it is recorded that it is many years since such untoward results have been noticed from the use of the drug.

In the case of leprosy a prolonged trial has been given to the newer remedies of sodium gynocardate and the ethyl esters of chaulmoogra oil. Between three and four thousand such injections have been given to about 120 patients during the years covered by this report. The results on the whole have been very encouraging. About 25 per cent. of the cases have apparently been cured and others have been greatly improved. Progress along these lines seems certain.

Another drug used for intravenous injection has been *tartrated antimony*. In cases of lung distomiasis (*Paragonimus westermani*) great disappointment has been felt. Though continued over considerable periods, checked by constant microscopical examination, the number of eggs expectorated did not appear to get less, nor were any signs of degeneration seen in their structure. On the other hand, in the treatment of *Granuloma pudendi* the intravenous use of antimony seems to be a real help, and the previous hopelessness of these cases makes any reliable treatment of great value. It has been stated that salvarsan cures these cases; unfortunately in these cases it has been found practically useless.

Another great advancement in treatment has been that of *cancerum oris* with salvarsan products. This horrible affection in children is not rare here as a sequel to measles. Usually the cases are fairly advanced when they reach the hospital; formerly the mortality was close on 100 per cent. Now, unless very advanced, it is usually possible to save 75 per cent. of the sufferers. The ethical problem is often a more difficult one than the medical in dealing with girl infants suffering from cancerum oris. The fate of a girl, who in a heathen land survives with a horribly disfigured face, making it practically certain that no man will marry her, is a terrible one.

Massive splenomegaly with cirrhosis of the liver and terminal ascites is a terribly common disease in Formosa. Its origin is uncertain and its treatment very unsatisfactory. The Pekin Union Medical Faculty are taking up the investigation of this disease in a very thorough way, and enormous benefit will be the result if such research can properly elucidate the aetiology and treatment of this condition. It is a disease that should be under the surgeon's treatment rather than that of the physician, as in suitable cases splenectomy has proved a complete cure for an otherwise fatal

disease. But the difficulties in the way are many. In not all cases of splenomegaly is the operation indicated, and early cirrhosis of the liver is not easy to diagnose. Anæmia in many of these cases is profound, and they stand severe surgical procedures very badly, even in not too advanced cases. In cases with much ascites the operation of splenectomy is nearly always fatal. With more satisfactory early diagnosis and improving surgical technique it is hoped to be able to save a much larger proportion of these patients, and the former of these it is trusted will be given by the work of the Pekin College. In the meantime for the relief of the ascites a trifling operation advocated in a recent number of the *British Medical Journal* has been tried—the insertion of a small silver stud with a central canal draining the peritoneal cavity into the tissues of the abdominal wall. This obviates the frequent tapings at constantly lessening intervals. The operation has given fairly satisfactory results in at least the prolongation of life and the relief of a very distressing condition.

In two cases this year an attempt has been made to relieve cases of *nephritis* not reacting to medical treatment by decapsulation of the kidneys. Some temporary improvement has resulted in both the patients, but present experience of the operation is too small to allow of any judgment of its value.

Eye Surgery.—A very interesting change is coming over the work in this line. While the number of the more critical cases, such as cataract operations, remains the same, the minor cases—for example, entropion operations—show a large and progressive decrease. This is undoubtedly due to the increasing number of Western-trained Formosan doctors practising in this city and throughout the island. More and more the minor work, both medical and surgical, is and will be taken over by these men. Unfortunately this means not relief but rather increased strain for us, as the proportion of severe cases in the hospital tends to get larger, while that of minor cases diminishes. Apart from illustrating this phenomenon on the ophthalmic work calls for no special comment.

The statistics show *appendicitis* to be rare here. Of the eight cases enumerated, two were on foreigners, and in another it was doubtful whether the appendix was really at fault. The writer, who operated on this case, suspected that it was in reality an intussusception that had resolved and left the appendix and cæcum greatly congested. It was thought wise to remove the appendix. In yet one or two more of the cases it was open to doubt whether the appendix was primarily affected. Still the disease is not wholly absent, and occasionally typical though very mild cases of recurrent appendicitis are seen, and a small number of definite appendix abscesses have occurred. The writer operated this year on a typical case of a gangrenous perforating appendicitis in one of the schoolboys. It is difficult to be certain whether the difference in diet compared with Western lands is responsible

for the rarity of the disease, but it is suspected that this may be the case. But it is thought that the disease, though still rare, is getting common.

Another disease of which almost nothing is seen is *cancer of the stomach*. It is met with from time to time, but with nothing like the frequency with which it occurs in England. Gastric and duodenal ulcers, however, are not specially rare, which seems curious.

In the second category, diseases met with here and not at home, is *chronic intussusception*. This probably comes first in abdominal emergencies. The diagnosis is often difficult, occasionally impossible, from tuberculous peritonitis, but a case is seldom missed. The treatment by ileo-colic anastomosis round the intussusception, which is almost never completely reducible, is eminently satisfactory in all except very advanced cases, both as to risk of life and after-history. One case, operated upon fifteen years ago, has led an active life ever since without recurrence of the trouble.

Uro-genital work is common, and except for the relative absence of enlargement of the prostate has little peculiar about it. The absence of enlarged prostate is probably more apparent than real. Cases are seen from time to time and an occasional prostatectomy done; but largely due to the very much shorter expectation of life, and probably also due to a fatalism to which the old people are particularly prone, they seldom reach the operation table.

Stricture of the rectum, due probably either to syphilis or gonorrhœa, is relatively common and often very extreme. The writer has seen a case where it is difficult to pass a probe through the stricture. They are greatly relieved and often cured by simple posterior proctotomy—a knife dividing the stricture posteriorly and cutting deep into the post-rectal tissues, especially as it emerges from the anus. This, followed by dilatation over a long period, for which the patients are provided with their own bougie, cures a large proportion.

Obstetrics and Gynecology.—There is no branch of medicine in which the work has increased so steadily as in this, proving, as little else could, the increased confidence in the hospital and its methods, as well as the greatly improved nursing arrangements for women patients. In the first six years that the writer was in charge of the hospital there were seventy-two obstetrical and gynecological operations. This year alone there have been 104. In those days it was unheard of for a woman to come into hospital for a normal confinement; this year there have been seventeen cases. Unfortunately there is no proper accommodation for obstetric cases, and this greatly limits the hospital's usefulness in this direction. If, financially, the way was clear and there was a nursing staff to overlook the work, the benefit would be very great both to the individual cases and in instilling into the women some of the first principles of obstetrical cleanliness, which are sadly lacking here. Despite this the amount of puerperal infection of a severe

kind is remarkably small, though cases of peri- and para-metritis are not rare. Obstetric emergencies, though probably not common as regards the population in bulk, are individually among the most serious cases brought to hospital. They are usually brought long distances after many ineffective attempts at delivery have been made. In the last week of this year two cases were brought to the hospital which illustrate the terrible condition in which these women arrive. One was brought in just breathing her last from hæmorrhage from placenta previa. Bleeding had begun a few hours before, and she had been seen by two Formosan doctors, who had each given her a hypodermic injection—nature not stated—and then departed. The other woman was brought in with the statement that she had been in labour a month! What the actual time had been was never discovered. The placenta in this case too was implanted on the lower segment; the child was dead and decomposed; by sloughing rather than rupture the uterus had perforated, and on delivery of the child after craniotomy the remnants of the uterus came down with the placenta, to which there were inseparable adhesions. This case also did not survive long. The writer has seen, since he first started work in Formosa, all the described obstetrical complications and not a few that find no place in midwifery textbooks. Such, for example, are neck presentations, the head having first been pulled off before the patient had been admitted, and also the reverse condition in which the body had been pulled off and the after-coming head left behind.

Gynecological work follows much the line of such work at home. Menstrual irregularities are extremely common, uterine displacements almost equally so, many of these being complicated by firm adhesions following on an attack of pelvic peritonitis as a result of marriage-gonococcus infection.

The amount of *cancer of the cervix* is appalling, probably not less frequent than at home and, it is believed, occurring on the average at a younger age. It is quite frequent to meet it in the thirties, and it has been seen in more than one case in the twenties.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE
EXOTIQUE, February 14, 1923.

A Pandemic of Malaria in Russia (L. Taraskevitch).—Owing to the bad state of affairs in Russia in general and the insufficiency of means to struggle against disease, malaria has spread to a great extent nearly all over the country. According to the Anti-malarial Commission of the Société de Pirogoff (Marzinovski), the yearly record of malarial cases was 5,000,000; during 1918-20 exanthematic-typhus

redominated, but since 1921 malaria has increased to 10,000,000 cases yearly. In Turkestan and the Caucasus the death-rate is appalling.

Adiposogenital Dystrophy in a Leper (M. Hirschberg).—A leper, now aged 37, who has been under observation at Riga since 1906, lost all symptoms of the disease in 1916. In 1922 he had developed fully the hypopituitary adiposogenital syndrome.

On the Use of the Bat as an Animal Reactive in Plague (M. Leger and A. Baurly).—The authors have found the bat a very good animal for experimenting purposes; it is very easily captured, easy to manipulate, and has no fleas. Death occurs twenty-eight hours after intraperitoneal inoculation of 0.1 c.c. of plague cultures; twenty hours after subcutaneous injections in the thigh; thirty-six hours after painting the nasal fossæ and thirty hours after puncture of the muscles of the hind limbs.

Amœbic Dysentery Cured by Stovarsol (E. Marchoux).—Two doses of 0.25 gr. of stovarsol administered every second day have given successful results in ten cases of amœbic dysentery. Cysts in the stools disappear rapidly, and the action is especially remarkable on *Amœba coli* and *A. dysenteriae*. In cases of relapse the author found one dose of 0.25 gr. every second day effective.

Malaria and Preventive Quinine. Clinical and Hæmatological Note (J. Rieux).—The author describes nine cases of patients who had taken quinine regularly during their stay in malarial countries as a prevention from the disease, but discontinued the use of quinine from the day of embarkation. On their voyage home, when they returned to Val-de-Grâce, they developed malaria; schizonts of *Plasmodium vivax* and rare schizonts of *P. præcox* were found in the blood.

A Case of Internal Leishmaniasis in an Adult Contracted in France (E. Bizard and E. Terrien).—This is the first case of visceral leishmaniasis observed in France in an adult. The patient, a lady, kept four dogs and two goats which used to pasture in a valley at Nice inhabited by natives from Morocco; the dogs were infested by ticks.

Anophelina and Malaria at Beyrouth (J. Legendre and J. Louis).—Researches of the authors prove that anophelina and malaria do not exist in Beyrouth in December as has been stated, and there are very few cases during the rest of the year. The larval sites of summer are swept away by the torrential rains, which last from mid-November to mid-March. During the dry season a few larvæ were found of *A. bifurcatus* and *A. superpictus*, the latter floating in colonies on seaweed. At Djédéde, a town in the valley near the river, none of the twenty-four French sailors living here two years contracted malaria, although they had never taken preventive quinine. Cases which have been reported as malaria were evidently cases of papataci fever.

Oriental Sore in the Country of Sand Dunes (R. Bidault).—Till recently the Sahara region was believed

to be exempt from oriental sore, but during the months of December and January last the author observed ten cases in young natives of El Oued who had never left the country. The transmitting agent is probably the sand-fly, which is very common.

A New Site for Human Trypanosomiasis at Tchad (E. Jamot).—Sleeping sickness is endemic at Fort-Lamy and in the villages of Kotokos fishermen of Bas-Logone and Bas-Chari. The principal focus appears to be at Kabe, which is a canoe building yard. *Glossina tachinoides* exists abundantly in these parts, but *G. palpalis* is rare.

On the Action of Sheep on Fleas (P. Delanoe).—The author has proved that sheep's wool not only kills fleas, but that it has no attraction at all for them. He recommends the rubbing of sheep's wool on men in Morocco, which may prevent them from being infested with fleas.

Contribution to the Therapeutics and Prophylaxis of Ankylostomiasis (E. L. Peyre).—Ankylostomiasis is the commonest disease in French Guiana. At Cayenne, 1914-22, 75.3 per cent. of the stools examined were found to be infected. Among the numerous treatments of this disease the author has found a dose of chenopodium, 4 c.c. with 30 gr. of castor oil, to be the most effective. Of 200 cases treated 83.4 per cent. were cured.

Three Simple Means of Preservation against Typhus (Brunet).—The means proposed for use are:—

- (1) Soap containing oxycyanide of mercury, 20 in 1,000, which can be used in fresh or in salt water.
- (2) Soap containing 250 parts of petrol per 1,000.
- (3) Sion lotion, composed of terebenthinated oil (of one-tenth strength) 100 parts, camphorated oil (one-tenth) 100 parts, vinegar 100 parts, petrol 200 parts.

A Case of Pseudo-typhus in Annam (E. Lagrange).—The patient complained of general fatigue on November 25, which was followed by coughing and congestion of the face and eyes. His temperature increased daily. A small ulceration, which ultimately reached 1.5 cm. in diameter, appeared on the left leg, and caused a small inguinal adenitis. November 29: Two plasmodia were found in the blood. Later there was tumefaction of the ganglia of the groin and axilla. December 2: Red patches appeared on the abdomen and wrists, and the whole body was covered with an exanthema which lasted only one day. Daily administration of quinine had no effect. December 9: After excessive perspiration the patient felt relieved, and gradually improved, and by January 1 was able to take up his work again, in spite of slight pain in the right arm. This affection resembles flood fever of Japan, and was probably caused by larvæ of *Microtrembidium*.

The Etiology of Tokelau (Aldo Castellani).—Cultures of the organism are described, and the author concludes that the classical opinion that tokelau is an aspergillomycosis is incorrect. Aspergillus, penicillium and like moulds found in the pellicles are there as saprophytes, and will not reproduce the disease.

The real ætiological agent is a fungus, closely related botanically to *Achorion*, for which the author proposes to make a new genus *Endodermophyton*. Tokelau can easily be produced experimentally, using pure cultures of the fungus, of which the author describes two principal species: *E. tropicale* and *E. indicum*.

Hæmatozoas of some Birds of Italy (G. Franchini).—The author gives the results of his studies (1921-22) on protozoas and nematodes, which are not rare in the birds of Italy. *Hæmaproteus* were found in *Chelidon urbica*, *Hirundo rustica*, *Alauda arvensis*, *Falco tinnunculus* and *Passer domesticus*. Leucocytozoon were found in *Albanella pallida*. The macrogametes were more numerous than the microgametocytes. Microfilariae were present in *Chelidon urbica*, *Hirundo rustica* for which the author proposes the name *Microfilaria veronesii* and also in *Carduelis carduelis*. Hæmogregarinæ were found in *Querquedula creca*.

On the Plague among Muridæ and Musaraignæ of Dakar (M. Leger and A. Baury).—Of 5,113 rodents and insectivores examined by the authors during a period of fifteen months, 259 were infected with Yersin bacilli. *Crocidura stamplii* Jentink (African musaraigna) is infected by plague bacilli in a proportion equal or superior to that of Muridæ. Of the different Muridæ, the percentage infected is greatest in mice: numerous *Xenopsylla cheopis* were found in all muridæ and musaraignæ of Dakar. *Mus musculus* is considered a dangerous agent in plague. *Golunda campanæ* is also a carrier of Yersin bacilli, then follow in order *Mus decumanus*, *Mus concha*, *Mus alexandrinus*, *Mus rattus*.

Urinary and Intestinal Bilharziosis in Senegal (M. Leger).—Vesical bilharziosis is very frequent in Senegal. Of thirty-six cases microscopically examined *Schistosomum hæmatobium* was found to be the cause of thirty-five, and in only one case were ova of *S. mansoni* found. Intestinal bilharziosis exists in a smaller proportion; only ten cases were observed; four were due to *S. hæmatobium* and the other six to *S. mansoni*.

The Chemiotherapy of Filariae: The Action of Amino-arseno-phenol on Microfilaria bancrofti (Dr. F. Noc).—Amino-arseno-phenol administered by intramuscular injections has a toxic action on microfilariae of *F. bancrofti*; this toxic action is felt after the first injection of the arsenicated compound. It appears to affect only a certain number of microfilariae, and the duration of the action varies according to the number of injections. It does not appear to have affected the adult filariæ situated in the large lymphatic vessels. Periodical injections of amino-arseno-phenol are suggested for persons suffering from lymphangitis, funiculitis, &c., taking into consideration the age, condition of the heart and kidneys, &c., of the patient.

Malaria at Zinder: Hæmatological Index (M. Leger, J. Pinaud, E. Bedier).—Malaria has spread rapidly in the colony of the Niger during the last few years, owing to stagnant pools which harbour anophelæ.

The blood examination of 250 children showed sixty-six cases under five years of age containing parasites; ninety-two between the ages 5 to 10 years and nine cases between 10 to 15 years. *Plasmodium præcox* was predominant and *P. vivax* very rare. The splenic index (26·4) of all the cases examined was much lower than the hæmatological index (66·8).

A Case of Aneurysm of the Abdominal Aorta (J. Lhuette and G. Hudelet).—The patient, aged 60, with a history of syphilis, showed very rapid development of a tumour which commenced beneath the posterior third of the tenth left rib, accompanied by extensive scoliosis with concavity to the left. Post-mortem examination revealed an enormous tumour occupying almost the whole of the left iliac fossa, caused by an aneurysm which had broken through the sheath of the psoas muscle. Five intervertebral discs were almost completely destroyed, and the bodies of the eleventh dorsal to the third lumbar were scarcely 5 mm. thick.

Simplified Method of Preparation of Ethyl Ethers of Chaulmoogra Oil (Boulay).—Ten grm. of Chaulmoogra oil, and 100 grm. of 95 per cent. ethyl alcohol containing 4 per cent. hydrochloric acid, are heated under a reflux condenser for two hours. The unused alcohol is recovered by distillation and the remaining liquid is poured into warm water, the ethyl ethers rise to the top and are decanted off and washed until free from acidity.

Hydatid Cysts of the Liver, Spleen, and Peritoneum in a Congo Native (M. Nogue).—A native tirailleur entered the hospital, at Dakar, for treatment of jaundice and diarrhœa. His liver was enlarged and painful, and the stools contained numerous amœbic cysts. On post-mortem a large quantity of ascitic liquid was found in the peritoneum. The right lobe of the liver contained a hydatid cyst the size of a hen's egg, there was also a small one in the left lobe. A third cyst occurred in the spleen and a fourth in the large intestine.

A Case of Hepatic Insufficiency with Jaundice, following a Series of Injections with Novarsenobenzol (M. Nogue).—A native, aged 35, admitted into hospital at Dakar for chronic alcoholism, was found to have a positive Bordet-Wassermann reaction and was given a series of injections of 914 and discharged. Eleven days later jaundice commenced; during further treatment in hospital crescents were found in the blood, and quinine and intramuscular injections of hectine were employed successfully.

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Original Communications.

TWO CASES OF RAT-BITE FEVER. RAPID CURE BY THE INTRAVENOUS INJECTION OF NEOSALVARSAN.

By ERIC C. SPAAR, B.A., M.D., B.S. (London), M.R.C.P.
Physician, General Hospital, Colombo.

It is only within the last few years that rat-bite fever has been recognized as a distinct clinical entity, and the aetiology of the disease definitely established. There is no longer any doubt whatever that the *matres morbi* is a spirochæte at any rate in Japan where Futaki and his co-workers in 1915 not only found this organism in the blood, and in the puncture fluid from the enlarged glands in seven out of nine cases, but further satisfied Koch's postulate by recovering it from the blood and glands of inoculated animals that were previously free from the infection.

Two types of this spirochæte have been found during life, as well as after death, but they belong to the same species as proved by culture: long forms, older in growth and exclusively found in the tissues of man; short forms, younger in the life-cycle, and found both in the blood of patients suffering from rat-bite fever and in experimental animals.

Previous to this every attempt at discovery of the causal organism proved fruitless, although the disease had been recognized in Japan since 1899 when Miyake first described it. Later in 1910, Horder, of St. Bartholomew's Hospital, London, described three cases, one of which was under his own care, and, believing the causal organism to be a protozoan, first gave the name of rat-bite fever to the disease.

Whether a spirochæte is the one and only cause of this peculiar fever, as may well prove to be the case, cannot be definitely stated at present. Schottmüller, for instance, in 1914 found a streptothrix—the *Streptothrix muris ratti*—in the tissues, lymph glands, and blood in a case clinically resembling rat-bite fever due to the bite of a squirrel in South Africa, which was pathogenic for monkeys. This was confirmed by Blake who cultivated the streptothrix from the blood and showed its presence in the vegetations on the valves in a case complicated by malignant endocarditis. As regards its pathogenicity for animals Blake's summary is:—

"The organism is very slightly pathogenic for rabbits and white rats, producing in some cases a local inflammatory, and proliferative reaction at the site of inoculation, and general lymph node hyperplasia. It is not pathogenic for guinea pigs." Later still in 1918 Douglas Colebrook and Fleming working for the Research Committee found a streptococcus in the enlarged axillary glands of a patient suffering from this form of fever which was agglutinated by his own serum, the patient recovering rapidly by the use of a vaccine.

No intracorporeal parasites or spirochætes were found but a polymorphonuclear leucocytosis was present. Other organisms have been mentioned as

causal agents in different parts of the world such as sporozoa mentioned by Ogata, and the *Micrococcus tetragenus* recovered by Openheim from the blood and the skin rash, a vaccine again benefiting the patient; but they are all probably only of historical interest. Row believes that all these are secondary invaders by infection of the wound caused by the bite, and suggests that the streptothrix obtained by Miss Tunnicliffe by culture from tissues which showed spirochætes, is of the same nature. Bass, however, believes the streptothrix to be a possible cause.

Up to the present about forty cases have been published in Japan, twenty in Great Britain, and about an equal number in America. A few cases have also been reported from the Continent of Europe. Castellani has mentioned the disease as prevalent in Ceylon and has further called attention to the belief which the natives have that the bite of a rat is a serious injury, and apt to be followed by leprosy. This belief I have myself found to be very widespread. It has, however, never been confirmed. Unfortunately, I have not been able to trace any reports of cases, if ever published. That the disease in this country is also caused by a spirochæte cannot be doubted since both my cases were rapidly cured by the intravenous injection of neosalvarsan. In the neighbouring Continent of India Row has found in the blood and lymph squeezed from the nodular rash a spirochæte in a similar case which he, however, believes to be different from the Japanese strain, as he says it is quite unlike that in size, shape and character of spirals. The spirochæte of the Japanese investigators is pathogenic to guinea pigs, monkeys, and white rats from whose blood it may be recovered by inoculation from man, but the disease in human beings is, according to Bass, caused "by the bite of the brown or black rats, and apparently never by mice or white rats." The disease conveyed by the bite of cats has been proved to be the same, the cats acquiring the infection by feeding on rats.

The *Spirochæta morsus murium* (Futaki, 1915) is described as actively motile, with a flagellum at each end. The movements are very rapid; unlike those of other spirochætes known to be pathogenic it is "thick in the middle and pointed towards the ends, being much shorter and thicker than *Spironema pallidum* and shorter than *Spironema refringens*."

As in the case of other spirochætes dark ground illumination of the microscope will demonstrate it clearly, as well as staining of a film by Giemsa's stain or the indian ink method. It is also stated that in suspicious cases the spirochæte can be demonstrated in the blood by the inoculation of white mice, the inoculated animal generally surviving. The following notes of two cases that have been recently under my care show many peculiar and interesting features, and record the main symptoms which are not yet sufficiently recognized.

Daniel, M., Singhalese, was admitted to the surgical side of the General Hospital with an inflammatory swelling of the right index finger of seventeen days' duration. The medical officer of the Welikaa

jail where the youth was employed as a domestic, had thought the swelling to be due to a whitlow, and had made incisions into it five days previous to admission.

The history given by the boy was that he was bitten by a rat eighteen days before admission on the right index finger, that the finger showed signs of inflammation the very next day, and that he had had an attack of fever a fortnight later.

The note made by the surgeon was that a discharging wound of the finger was present, and that the epitrochlear and axillary glands on the same side were enlarged. The wound quickly healed, and the inflammation of the finger subsided under treatment by lysol baths.

September 28: He was transferred to my care as a case of malarial fever.

Condition on Examination.—A well-nourished lad, bright and intelligent. He complained of aches and pains in his limbs. A scar was seen on the outer side of the right index finger 1 in. in length. The axillary glands on the left side were enlarged and easily palpable. No other enlarged glands were discoverable.

Tongue furred. No carious teeth.

The bowels erred on the side of constipation.

Heart, lungs: No abnormalities.

Spleen and liver were not enlarged.

From the history and as a result of the examination I at once suspected the true nature of his disease, and decided to keep the little patient in hospital for careful investigation. The blood was repeatedly examined for malarial parasites and spirochaetes, always with negative result. A differential blood count showed an increase of the polymorphonuclear cells, but there was no eosinophilia. P. 78.6, L. 19.4, M. 0.8, E. 1.2 in a count of 500. On November 2 I injected a guinea-pig with 2 c.c. of the patient's blood drawn from a vein at the elbow with aseptic precautions. The report sent me by Mr. Burgess, the Acting Director of the Bacteriological Institute, who kindly undertook the further examination, was "the first guinea-pig inoculated with the boy's blood died within two days. Microscopical examination for spirochaetes proved negative.

"A second pig was inoculated and this died eight days later. The blood, liver and kidneys were carefully examined but no spirochaetes could be detected. *Staphylococcus aureus* was obtained from the blood and liver." This was undoubtedly due to a contamination and was not pursued further.

On November 8 all attempts to isolate the *matrices morbi* having proved futile, a first intravenous injection of 0.2 gm. neosalvarsan was given. Up to that time the boy was steadily losing weight and had complained at various times of headache, pains in chest and back, sore throat and cough, pains in eyes, legs and hands.

The course of the temperature is well seen by an inspection of the chart 1. A second injection of 0.25 gm. neosalvarsan was given on November 20. By December 14 it was not possible to detect any enlargement in the axillary glands, but a further

slight rise of temperature on December 21 called for further treatment, and although the patient was well in every other respect and putting on considerable weight, a third injection was given the following day, December 22, and in order to make sure against a relapse as the boy was wishing to leave hospital, a fourth injection of 0.2 gm. was given on the 30th. He has had no further relapse according to information received.

Case 2.—Justin Caldera, Singhalese, 31, a laboratory attendant at the Municipal Bacteriological Laboratory, was admitted to hospital under my care on March 7, 1923, with the following history:—

February 13: Bitten by a rat on the palmar aspect of the distal phalanx of the left thumb. The wound was cauterized by pure phenol and apparently healed in four days.

March 2: Loss of appetite and pain in the middle molar tooth of the lower jaw on the left side, which on admission was found loose in its socket. He had never had toothache before.

March 4: Pain and tenderness of the thumb that had been bitten on waking in the morning. Headache, fever, burning pain in the eyes, pain in the left axilla and behind the left ear.

March 8: Cough and dyspnoea. He noticed that he passed very little urine, only twice in the twenty-four hours, and the act of micturition was attended with burning pain in the urethra.

March 9: Admitted under my care. He was of average height and build. Temperature 100.4. Pulse 66.

No signs of disease were found in the thoracic and abdominal organs. The urine was free from albumen and casts. No malarial parasites or spirochaetes were seen in several blood films examined.

A polymorphonuclear leucocytosis was observed in the blood count. The actual figures were P. 86.4, L. 8.6, M. 3.8, E. 1.2. There was no eosinophilia. The axillary glands on the left side were enlarged, one of the size of a half-crown. There was nothing noteworthy about his family or personal history. He had had malarial fever twice—the first attack ten years and the last four months before his present illness; acute rheumatism had involved his ankle and knee joints on two occasions at the ages of 5 and 16.

TREATMENT AND PROGRESS.

March 10: *Vesperi.*—Headache, pain in the chest, discomfort in the epigastrium, thirst, and an irritable cough with a feeling of restlessness.

March 11: Feeling better. The headache and pain less intense. Slight tenderness at the site of the bite.

March 12: Feeling better. No headache or pain in body anywhere. No restlessness. Had slept well. Complained of much sweating during the night. The axillary glands were much smaller and softer than before (the size of a sixpenny-bit), though slightly tender, enabling the arm to be raised much more than before.

March 14: There was slight lymphangitis of the left forearm, and at the junction of its lower with the

Stated he had been sweating on the previous night, too. Headache was again present, and the left lower extremity below the knee was painful.

Two smaller but similar swellings were seen on the inner side of the left arm the size of a split pea, but there was no inflammatory redness, and another nodular and tender swelling the size of a sixpence appeared in the skin on the inner aspect of the left



thigh at the junction of its upper and middle one-third. Pain was complained of on the left side of the neck, and the axillary glands felt more tender and seemed larger.

March 16: Pain was complained of on the left side of the chest, the left hand and left leg, and the nodules were very tender. The temperature was rising and the patient felt and looked very ill. The axillary glands were distinctly larger and were very painful and tender. Under the circumstances it was thought advisable not to keep the patient for observation any longer, and an injection of 0.45 gm. neosalvarsan was given intravenously at 5 p.m.

The effect was again remarkable. The following morning the patient complained of a slight headache, and a smaller nodular swelling was further noticed on the sole of the left foot, but the other nodular swellings were smaller and less painful and the axillary glands smaller, less painful and tender. On the 18th the patient felt much better, and by the 23rd the nodular swellings had all disappeared and the axillary glands were no longer palpable. Convalescence was quite rapid, and as the patient insisted on leaving, he was discharged on April 5.

juice obtained by puncture from the glands were spirochaetes seen. The rapid cure, however, after the intravenous injection of neosalvarsan undoubtedly proves the spirochaetal nature of the disease. A guinea-pig and a rabbit were inoculated with blood drawn from a vein at the bend of the elbow on March 11. Both animals remained well and spirochaetes were not found in the blood of either. The failure to detect *Spirochaeta morsus murium* though disappointing is not surprising, seeing that presumably it has up to the present been observed only by Futaki and his associates. It is only in the early phases of the disease that the organism circulates in the peripheral blood; in the convalescent stage it is found in the kidneys and is possible to be detected in the urine, a similarity to Weil's disease. Horder's and Burton-Fanning's cases though thoroughly investigated gave no results. Of six guinea-pigs inoculated with the blood from Fanning's patient by Foulerton, four remained well. Row states that he met with

MARCH 1923.

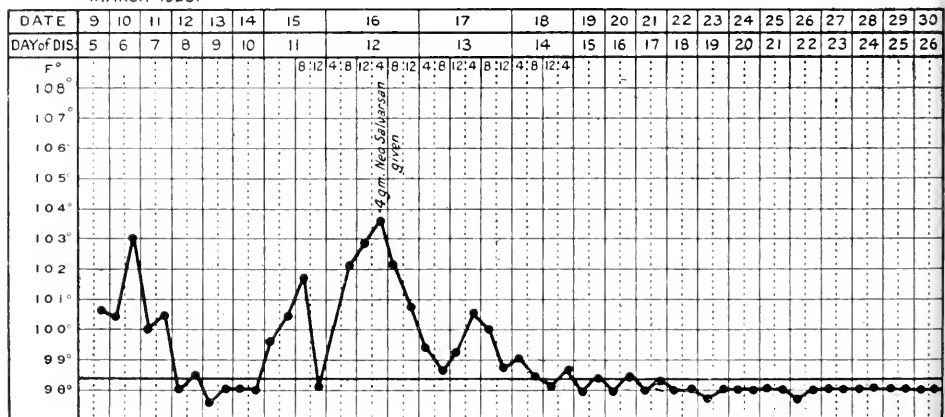


CHART 2.

The noteworthy features of the case were the rapid cure after only one injection, the pains on only the left side of the body and the presence of nodular swellings in the skin which are only recorded as being present in Horder's cases, and were different from those recorded by Row. These swellings were also found only on the left side. There was no rigor or chill before either of the paroxysms of fever, no pains had been felt in the joints and no rash was ever seen. Only before the first bout of fever was the finger felt to be painful. There was no increase of the tendon reflexes, nor any stiffness round the joints of the finger bitten. Profuse sweating accompanied defervescence on each occasion.

The bacteriological examination was again undertaken by Mr. Burgess in addition to my own search for the cause, but neither in the blood nor in the

failure to detect spirochaetes in the blood of patients affected for ten years. As regards the incidence in rats, the Japanese workers have found the spirochaete in one out of forty-three house rats examined.

The incubation period of both my cases agrees with the observations of others and was a fortnight or a little over. The pyrexial period was of two or three days duration, with an afebrile interval in the first of five days, generally the paroxysms occurring with clock-work regularity and sudden onset, and in the second of only three days (vide chart). These intervals were shorter in the early stages.

An afebrile form of the disease has also been observed in Japan. Lymphangitis was present in only one of the cases. It has not been frequently observed in the European cases but is stated to be a common feature of the disease in Japan.

Treatment by the intravenous injection of the arsenical preparations has invariably been successful in the prompt cure of the disease since Hata in 1912 first advocated it even before the spirone was discovered.

Often one injection suffices to bring about an abrupt cessation of the fever as in Case 2 here reported and in Fanning's Case 3. Sometimes the dose has to be repeated more than once. There was a slight relapse of Case 1 after four weeks; Burton-Fanning has observed a relapse after five weeks. Without this specific treatment, the disease has been known to run a lengthy course, sometimes for many years, although complications are rare. In an Italian case there was retro-ocular cellulitis and exophthalmos after two years and albuminuria with dropsy. Albumin and casts occur frequently in the urine but were absent in my cases. The mortality in Japan without treatment is 10 per cent., with treatment the recoveries are 100 per cent. Whether one attack will confer immunity and for how long is not known, but immunity substances have been demonstrated by Ido and his associates, who on mixing the blood of recovered rat-bite cases with that from a guinea-pig inoculated by the bite of rats, found that the spirochaetes present in the latter were destroyed.

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NOTE ON A CASE INFECTED WITH *DIENTAMOEBA FRAGILIS*, JEPPE AND DOBELL, 1917.

By ANDREW ROBERTSON, M.B., Ch.B.

Grocers' Research Scholar and Assistant in the Department of Protozoology, London School of Tropical Medicine.

THE patient was a young woman who was admitted to hospital as a case of suspected entamæbic dysentery. Her history revealed that she had been subject to bowel trouble in one form or another for the greater part of her life. Thus, during childhood and adolescence, which were spent in South America, she suffered from chronic constipation, and this condition persisted until she went to Egypt in 1916. She remained in Egypt from 1916 until 1919, and in the course of her stay there had several diarrhoeic attacks, which, however, were not associated with infection by any protozoal organism. At the end of her stay in Egypt she went to the Punjab, where she resided up to the time of her return to this country early in 1922. While in India she had a severe attack of

dysentery, and *Entamæba histolytica* was found in the stools. Since then she has suffered from recurrent attacks of diarrhoea accompanied by pain and tenderness along the line of the large intestine which was frequently much distended. As it was suspected that her condition might still be due to the presence of *E. histolytica* the stools were examined as a routine measure. Altogether she was under observation for thirty days, and her stools were examined on fourteen occasions over this period.

In the sixth stool of the series *Dientamæba fragilis*, Jepps and Dobell, 1917, was found, and thereafter no difficulty was experienced in demonstrating it in all the subsequent specimens. The proportion of uninucleate and binucleate forms in this case showed a considerable variation from the cases described by Jepps and Dobell and by Thomson and Robertson, 1923. In the cases reported by these authors the uninucleate forms were roughly 20 per cent. of the total, whereas in this case they reached nearly 40 per cent.

With regard to the nuclear structure the findings in the present case are similar to those described by Thomson and Robertson. That is to say the nucleus is spherical, vesicular and is delimited by an extremely fine achromatic nuclear membrane. The chromatin, usually consisting of about five irregularly-sized granules, is most frequently grouped in the form of a ring at a varying distance between the nuclear membrane and the centre of the nucleus. Further, in the centre of the ring of granules there is in the majority of individuals a smaller granule which does not stain in exactly the same way as the chromatin. It is possible that this centrally placed granule is the karyosome. In some specimens in this case the chromatin granules, instead of occupying an intermediate position, actually appeared to be situated on the nuclear membrane. The nuclei in such individuals were very much like the nucleus of *E. coli*, but, of course, on a very much smaller scale.

A heavy infection of *Blastocystis hominis* was present in all the stools. In the first five stools examined there were fairly numerous *Trichomonas hominis*. These showed in some instances three anterior flagella, in others four and rarely five. It is difficult to say whether the infection was one of *Trichomonas*, *Tetratrichomonas*, or *Pentatrichomonas*, but as the largest number showed four anterior flagella the probability seems to be that it was *Tetratrichomonas*. *Chilonastix mesnili*, both free forms and cysts, showed up from time to time, but were never numerous. There were also a few *Endolimax nana*. Even in the fresh unstained condition the *E. nana* were easily distinguished from the *Dientamæba*. They were larger in size and their cytoplasm had not such a yellowish tint as the *D. fragilis*. Cysts of *E. nana* were only found on two occasions.

As is fairly frequently the case in chronic diarrhoeic conditions numerous *Spironemata* were found. *S. eurygyrata* was especially plentiful, while *S. stenogyrata* was also quite easily distinguished. Of the remainder *Spironemata* morphologically similar to

S. refringens and *S. gracile* were the most common. There was a thick *Spirillum* present in all the stools, usually about 5 μ long and about 2 μ in width. This organism was extremely motile in the fresh, but, for some reason or another, was very frequently ingested by the *E. nana*.

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INTESTINAL PARASITES IN THE SUDAN.

By VINCENT S. HODSON, M.V.O., M.B., M.R.C.P.
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IN all tropical countries intestinal parasites are exceedingly common and infestation gives rise directly to much ill-health and disability, while in addition to these direct obvious results worm infections by lowering the individual resistance lay the individual open to other diseases, recovery from which is hampered by the patient's poor recuperative power. For instance, it has been recorded repeatedly that the Egyptian peasantry take malaria very severely, and that it is so can hardly be wondered at in view of the tremendous prevalence of ankylostomiasis and bilharziasis among the Fellahs. The lowering of resistance progresses *pari passu* with the development of anæmia. Apart from these general effects, there are special complications of worm infections which have to be remembered as possibilities. I have recorded a case of peritoneal abscess due as far as could be made out to *Tænia saginata*.

I have seen a case of temporary obstruction due to the same worm, and I have operated on a case for appendicitis in which it appeared that the trouble must have been caused by an ascaris.

In Egypt where worm infections are grosser and more common than in the Sudan, the effects in retarding growth and physical development are as serious as they are striking.

Having these points in mind I have endeavoured of recent years to get the stools of as many patients as possible examined as a matter of routine, and I have been fortunate in having Mr. Newlove as my assistant for the actual carrying out of the examinations. Mr. Newlove has done all the actual examinations and is extremely expert in these matters. In addition to the examinations of patients actually in hospital, I have been able to arrange for the investigation of a considerable number of boys at the Gordon College and at the Omdurman School where the work has actually been very satisfactorily performed by a native trained by Mr. Newlove and myself. Cases of extraordinary infections occur from time to time and are detected as a result of the routine examination of stools. For instance, (1) a man came in for a crushed foot and was found to have in addition to malaria, relapsing fever, ankylostomiasis, *Tænia saginata* and both varieties of bilharziasis; (2) a chicken pox patient was found to have malaria, filaria, *Bilharzia*

mansoni, *Tænia nana*, ankylostomiasis and oxyuris; (3) an Abyssinian produced thirty-one complete *Tænia saginata* as the result of one course of treatment. One observation which has resulted from this systematic stool examination is that in cases of malaria complicated with *Bilharzia mansoni* the spleen is commonly considerably more enlarged than is usual and does not diminish seriously in size unless and until the *Bilharzia mansoni* is treated. This is of interest because the symptoms of a bilharzia infection, sufficient to cause enlargement of the spleen, are often and even commonly so slight as not to be observed by the patient, so that the real cause of the splenic enlargement might easily be missed unless a routine examination of the stools was made. This bilharzial splenic enlargement does not occur in my experience in urinary schistosomiasis, and I presume that this variation is due to the tendency of the hæmatobia worms to congregate in the neighbourhood of the bladder, while the worms of the mansoni infection are more commonly found in the liver and upper reaches of the portal vein.

I give herewith the figures for various examinations:—

(1) Twelve months' investigations at Khartoum Civil Hospital.

(2) Investigations of Gordon College boys in 1922 by two observers.

(3) Investigations of Gordon College boys in 1923 by two observers.

(4) Investigations at Omdurman School in 1923.

(1) *Khartoum Civil Hospital*.—Twelve months.

Not examined	Negative	Positive	Ankylostomiasis	<i>Tænia saginata</i>	<i>Tænia nana</i>	<i>Bilharzia hæmatobia</i>	<i>Bilharzia mansoni</i>	ASCARIS	Trichurias	Oxyuris	Stercorælysis
499	713	577	277	92	93	8	101	66	39	83	9

Forty-four per cent. of patients were positive.

(2) *Gordon College Boys*, 1922.

Observer (1): 67 cases of which 31 were positive.
Observer (11): 29 cases of which 7 were positive.

(3) *Gordon College Boys*, 1923.

Observer (1)—

Positive	Negative	Ankylostomiasis	ASCARIS	<i>Bilharzia mansoni</i>	<i>Fasciola hepatica</i>	Heterophyes	Oxyuris	Strongyloid	<i>Tænia nana</i>	<i>Tænia saginata</i>	Trichurias
57	40	6	1	22	1	1	6	1	25	8	1

¹ Major Archibald in his paper on "Intestinal Schistosomiasis in the Sudan," published in the *British Medical Journal* of February, 1914, has previously drawn attention to this association of enlarged spleen and *Bilharzia mansoni* infestations.

Forty-one boys had a single infection, 15 had a double infection and one a triple infection.

Observer (II)—

Negatives	Positives	<i>Tenia saginata</i>	<i>Tenia nana</i>	<i>Bilharzia mansoni</i>	Ankylostomiasis	Ascariis	Total
106	44	3	25	12	4	1	198

(4) Omdurman School, 1923.

Boys examined	<i>Tenia saginata</i>	<i>Tenia nana</i>	<i>Bilharzia mansoni</i>	Ankylostomiasis	Oxyurias	Ascariis	Total
586	8	191	17	9	19	1	245

Pellagra in Portugal (J. A. Pires de Lima, *J. Medicina Moderna*, 1923).—The author quotes large portions of the Pellagra chapter in Castellani and Chalmers' book. He adds some interesting information on the geographical distribution of the malady in Portugal. The disease is very common in the Minho province.

Note on a Case of Aerophagy in an Annamite (H. Coppin).—A pharmacist, aged 25, complained of slight pain of the epigastrium; on examination no serious symptoms were perceived. Treatment with santonin and thymol was ineffective, and there was swelling of the epigastrium after the ingestion of food. Several months later radioscopic examination revealed dilation of the stomach. After disappearing for three months the patient came again to be examined and was in a very poor condition of health. This time examination showed evident aerophagy.

The Intestinal Flora in Mouse Typhoid Infection (Leslie T. Webster, *Journal of Experimental Medicine*, vol. xxxvii, No. 1, January, 1923).—The normal flora of laboratory mice at the Rockefeller Institute, fed on bread and milk diet, was determined. *Bacillus acidophilus* and *B. bifidus* outnumber the *B. coli*, *B. acidilactici*, and *B. coli communior* group about twenty-five to one. White or yellow cocci which may or may not liquefy gelatine are occasionally noted; spirochaetal and vibrio forms and yeasts are usually seen in stained preparations. This flora does not change when mice are artificially infected *per os* with a strain of mouse typhoid bacilli (*B. pestis caviæ*) and is the same in animals which resist the infection as in those which succumb.

Mice fed on meat diet and showing a colon, *B. diffluentis*, and *B. welchii* flora do not differ in susceptibility to mouse typhoid from the normal mice fed on bread and milk and showing the above *acidophilus* flora.

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THE JOURNAL OF Tropical Medicine and Hygiene JULY 16, 1923.

FLOWERING PLANTS AND THEIR OLD-TIME USES.

The uses of aromatic plants and their essences have gradually lessened in their universality since tobacco came to be used. Time was when the odour of

flowers and of flowering plants was a study closely followed and a creed of one's belief. Flowers were not cultivated in our gardens in early times for show for the most part, but for their uses in the prevention of disease, for religious ceremonies, &c.; when mankind dwelt in the open country to a greater extent than is the case now; when flowers were no rarity as they are within the crowded cities of the twentieth century; and cut flowers are placed in our dwelling rooms because potted plants do not thrive there.

The writer has lately been inquiring into the nature of the plants and flowers used in towns of, say, two or three centuries ago as compared with those of to-day. In the cities of more ancient date drainage was, as we know it to-day, wholly unknown. Open sewage channels, cesspits, middens, and removal of excretion by buckets of faulty finish polluted the atmosphere with unsavoury odours. The air of the churches was foul; gatherings in town halls were smelly to a degree; schools, with closed windows and long hours of attendance from, say, eight in the morning to six in the evening, with all too scant accommodation, made the life of the child a drudgery and tended to weaken those who actually escaped the heavy mortality amongst the children attending schools.

Under these circumstances something had to be done, and the only device which seemed possible was overcoming the foul air and the effects thereof by incense burning in churches, by scattering aromatic flowers at public meetings, by strewing herbs sprinkled with vinegar in our law courts and in gaol to serve as prophylactics to overcome "gaol distemper"; the custom of placing bouquets on the chairman's table at meetings and before judges in court arose from the same reason.

These practices came specially into vogue during the Great Plague of London which lasted well nigh 100 years, for it is a mistake to imagine that the Great Fire of London stayed the plague. The effect of the Great Fire was to scatter plague over rural Britain by driving the plague-infected rats from their burrows to spread the disease broadcast from London to the provinces until the utmost corners of the British Isles became infested. Every aromatic plant and flower was cultivated, and huge prices were paid for several; mignonette, thyme, the geranium and a number of others were placed in our windows to prevent flies, fleas and other insects finding their way into houses. The custom remains to-day in rural England from times when malaria reigned supreme. In our villages the geranium remains the chief decoration of our cottagers' window sills, as the plant was considered to be forbidding to winged insects passing the geranium with its musty odour. Curtains likewise came into vogue especially where glass was not as yet in universal use. The curtain was of fine mesh through which the insects could not pass; and to-day we find the combination of the geranium and muslin on the cottager's window. The following was one of several answers sent to my inquiry per Mrs. H. Roper, who undertook the inquiry of the plants and flowers now in use at official time-honoured ceremonials in and around London.

The letter emanated from the Secretary of the Royal Botanic Gardens, Kew, by the courtesy of the Director of the Gardens, who states that he regrets that although a long search has been made in the library so little information of a definite and satisfactory character has been obtained.

"The rue (*Ruta graveolens*) is known to have been used at the Old Bailey. Both this and wormwood (*Artemisia vulgaris*) were regarded as valuable prophylactics. A writer in the *Gardeners' Chronicle*, vol. iv, 1875, p. 645, referring to the rue as forming 'one of the component parts of the celebrated French prophylactic known as the "Vinaigre à quatre couleurs," which was supposed to be an efficacious remedy against the plague' says: 'In this capacity, indeed, rue was in great repute among ourselves. It was long, and probably still is, the custom to strew the dock at the Central Criminal Court of the Old Bailey with rue; and in Lawrence's "Life of Fielding" we are told that this use arose after a contagious disease, known as the "gaol distemper," which had been engendered by the foul atmosphere there, in or about 1750, after which herbs sprinkled with vinegar were strewn about to avoid the recurrence of a similar catastrophe.'

"In 1673, Archer ('Every Man His Own Doctor,' p. 119) wrote of the rue: 'It is a great antidote against all infection, plague, poisons, &c.'

"From statements found in various books it seems probable that other plants besides the rue were used, and apparently for a similar purpose, but it has not been possible to ascertain precisely what they were. They are sometimes referred to as 'aromatic herbs,' and it is probable that amongst them were balm (*Me'tissa officinalis*), lavender (*Lavandula vera*), hyssop (*Hyssopus officinalis*), tansy (*Tanacetum vulgare*), marjoram (*Origanum vulgare*), camomile (*Anthemis nobilis*), costmary (*Chrysanthemum balsamita*), basil (*Ocimum basilicum*), sage (*Salvia officinalis*), winter savory (*Satureia montana*), pennyroyal (*Mentha pulegium*) and other mints, for these and several others are included in a list of 'Strewing herbs of all sorts,' published in Thomas Tusser's 'Five Hundred Points of Good Husbandry,' published in 1577. To them almost certainly should be added the rosemary (*Rosmarinus officinalis*), which is not included in Tusser's list.

"Mrs. Roper may be able to see Miss Lambert's articles on 'The Ceremonial Use of Flowers,' published in the *Nineteenth Century*, No. 19, September, 1874, and No. 39, May, 1880. This publication is not at Kew, so the Director cannot say whether or not the articles contain such information as is now required. W. A. Barrett's 'Flowers and Festivals' (London, Rivington, 1873), also not at Kew, may be worth consulting. It could no doubt be seen in the British Museum.

"It is announced that a work on 'Curious Survivals,' by Dr. G. Williamson has recently been published by Herbert Jenkins, and that it contains allusions to the practices referred to in Mrs. Roper's letter, but the Director does not know whether any attempt has been made in it to identify the herbs said to be used."

The Chief Clerk writes from the Mansion House:—"In reply to your letter of June 21, 1923, the florist informs us that the following are the herbs which composed the bunches of flowers you mention: mignonette, cornflowers, marigolds, pyrethrums, cœreophthens, love-in-the-mist and iris."

A number of the aromatic herbs used in cookery are ascribed by Dr. Sambon to their uses as intestinal disinfectants, most being regarded as vernifuges and anthelmintics. The onion and shallot are in universal use. The peppers—red, white, and black—are intestinal stimulants, as being especially useful by their action on the colon.

Of late years the flowers of our gardens, especially for the past fifty years or more, are largely hybrids come from original aromatic herbs and flowers formerly used for medicinal purposes and as deodorants.

The many essences, especially those of Chinese and Indian origin, are used largely also as deodorant and gastro-intestinal disinfectants, stimulants and anthelmintics, and as scents, when baths were less used than now, as a means of obscuring "body" emanations.

The subjects of aromatic bitters, oils, essences, such as cloves, caraway, peppermint, thyme, eucalyptus, balsams, gum-resins, &c., &c., are interesting. And inasmuch as their effluvia or specific odour finds exit by way of the skin, the breath, the excretions of the kidneys and the bowel proves that on their passage through the body must penetrate the tissues, an effect for good or evil may result. Flowers and plant odours may therefore have some of the consequences ascribed to them in ancient lore, and the witches' tales of cant and mystery, which charm our poems and tales of love, may have a basis of fact which we are ever too ready to condemn as emanations of fancies and hysterical beliefs.

J. CANTLIE.

Annotations.

A Case of Pseudo-Coma and Retention of the Urine by Ascariasis (H. Coppin, *Bulletin de la Société Médico-Chirurgicale de l'Indochine*, tome i, October, 1922).—A healthy boy, aged 15, was suddenly overcome by progressive somnolence and chronic constipation which lasted seven days. The bladder was enlarged and easily perceptible, but no other symptoms could be traced. Three doses of santonin 0.15 grm. and one dose of castor oil 30 grm. brought out, in all, twenty-four ascarides. The lethargic condition of the patient improved gradually.

Public Health Aspects of Yaws (A. W. Sellards, *Philippine Journal of Science*, vol. xxii, No. 3, March, 1923).—Neosalvarsan in the hands of medical men can, with proper precautions, be used safely on an extensive scale under field conditions. The diagnosis of the granulomatous stages of yaws is simple. A

Wassermann outfit, though not indispensable, is a valuable adjunct even in field work. The treatment presents no special difficulties. In the tropics, routine examination of the urine is not a prerequisite before administering neosalvarsan.

Certain details of field operations are still *sub judice*, or are subject to modification according to varying local conditions. It has not been accurately determined whether latent or tertiary cases of yaws constitute important sources in the infection of susceptible individuals. Further observations are desirable regarding the feasibility of substituting intramuscular for intravenous injection of neosalvarsan, especially when work is conducted under the disadvantage of limited personnel.

Bronchopneumonia (Lt.-Commander W. A. Bloedorn, *Military Surgeon*, vol. li, No. 6, December, 1922).—Bronchopneumonia is a more common disease among active, robust, young adults than has hitherto been thought. Mild types of this disease may present no subjective evidence of a pneumonia, and may be easily overlooked unless a careful routine examination of the chest be made.

In the absence of definite findings these cases are usually diagnosed acute bronchitis, influenza, acute pharyngitis, or severe coryza.

The X-ray as an aid in diagnosis is invaluable, and will confirm physical findings as well as reveal areas of consolidation which present no physical signs. It is also of great value in determining the degree of resolution.

The importance of recognizing these mild types of pneumonia hardly needs emphasis. The danger of complications and sequelæ in pneumonia is much lessened by adequate precautions and a longer convalescence which follow, as a matter of course, the recognition of the disease.

The Relation of Carbohydrates to the Output of Bile Pigment (Peyton Rous, G. Brown and Philip McMaster, *Journal of Experimental Medicine*, vol. xxxvii, No. 3, March, 1923).—Carbohydrate feeding or injection produces often a temporary increase in the rate at which bilirubin is put forth in the bile, but none in the amount of the pigment secreted from day to day. There would appear to be no ground for the supposition that bilirubin is normally derived in part from the carbohydrates of the food.

The Treatment of Pruritis Ani with Bacterial Injections (F. C. Knowles and E. F. Corson, *Archives of Dermatology and Syphilology*, vol. vii, No. 4, April, 1923).—"The authors' results compare favourably with those of Winfield and Murray. In Winfield's forty cases, all but six patients were permanently cured with bacterial injections. Four of these six were improved by further injections.

Murray treated 168 patients with *Streptococcus faecalis* and had only thirteen failures.

Five of six of the authors' patients were cured

by using this method, further injections being required in two of these that relapsed.

Eleven patients received an insufficient number of injections to judge as to the final outcome with this method of treatment.

One patient was cured with injections of colon bacilli.

Injections of *S. faecalis* vaccine offer the best means of cure of pruritis ani.

Dosage should be large and continued over a considerable period. All pathologic conditions should be excluded before this method is considered.

Injections of *S. faecalis* vaccine are given to raise the opsonic index, which is found to be below normal in this type of case.

Abstracts and Reprints.

THE NATURE OF ARTERIO-SCLEROSIS.¹

By GEOFFREY EVANS.

The study of the pathology of arterio-sclerosis has impressed the author with the vivid picture of reaction in tissues to insult, response to injury, and repair of damage done. Great students of pathology such as Virchow interpreted the lesions in terms of inflammation, Thoma in terms of involution, and Jores in terms of growth. These men, at least, have failed to grasp the cloven hoof of decadence and decay. It is asking too much to expect a *restituto ad integrum* in arterio-sclerosis, and, as in tuberculosis of the lung, one may be well content with a lesion that heals by calcification and fibrosis. The prospect of recovery in vascular tissue is indeed better than it is in the parenchyma of the lung; new vessels are formed more easily than new parenchyma. Louis Gross has demonstrated the formation of new vessels in the kidney of renal sclerosis, and the rapidity of their formation is strikingly illustrated in thrombo-angiitis obliterans, where new vessels may be formed in the lumen of the affected artery before the original process of disease has subsided, so that the new vessels may themselves be affected by the original process of disease. Again, it is remarkable evidence of the healing power of vessels that aneurysm of the aorta is rarely due to arterio-sclerosis even when present in a severe degree. There is a big field for inquiry in clinical medicine where evidence of the healing of arterio-sclerosis may be collected, and yet before the gate into this field is opened the clinical diagnosis of arterio-sclerosis needs a closer approach.

Arterio-sclerosis is a lesion characterized by a pathological thickening of arterial coats, particularly of the intima; inflammatory reaction is of first importance; degenerative changes are an essential part of the picture; hyperplastic and involutionary processes play a part; no unit factor is responsible for its causation. Its development in its extent and form depends on a balance between the action of toxic agents and the power of resistance of the vessel wall to their attack.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE.

March 14, 1923.

The Musaraigna as a Reservoir of Plague Virus at Gamboge (C. Mathis).—Coccobacilli found in the shrew-mouse have been identified as Yersin bacilli; this animal is frequently met with in houses. During the first half of 1922, 10 per cent. of 24,460 animals captured were *Crociodura*, and during May and June of the same year, of 363 animals sent to the laboratory for investigation, 10 per cent. were *Crociodura*, 40 per cent. *Mus decumanus*, and 50 per cent. *Mus rattus*.

Transmission to Laboratory Animals of the Spirochæta of Recurrent Soudanese Fever (A. Gambier).—This spirochæta causes a benign affection without relapses in the monkey, and the animal remains immune for several weeks. The rabbit and the guinea-pig are refractory; white mice appear to be inoculable with great difficulty. The author is of the opinion that *Pediculus vestimenti* is a carrier of recurrent fever in the Soudan.

Researches on the Inoculation of White Mice with Latex containing Parasites. Experimental Abscess of the Liver determined by Amæba of Latex (G. Franchini).—Infected latex of Euphorbia plants was given *per os* to nine mice, two of which developed abscess of the liver; it caused a slight affection in the remaining seven.

Natural Debab of the Dog. Transmission by Stomoxys (A. Donatien and F. Lestoquard).—*Stomoxys* has been found to be the carrier of *Trypanosoma berberum* of the dromedary to the dog. Infected animals had enlarged spleens, hypertrophied lymph glands, bone-marrow red and diffuent, enormously congested livers and pale kidneys.

Conservation of the Virus of Canine Leishmaniasis on Dogs in the Laboratories (Ch. Nicolle and Ch. Anderson).—To obtain successive passages of kala-azar on dogs the authors suggest the following method:—

(1) The infection, whether natural or experimental, must be severe.

(2) The virus must be fresh.

(3) Use the bone-marrow, as it invariably contains leishmania in abundance. Take out the medullary contents of the principal long bones, pound them lightly, add 20 c.c. of physiological sterilized water (double quantity for a big dog).

(4) Inoculate 6-8 c.c. of the emulsion in the peritoneal cavity of each dog.

The inoculation of bone-marrow sometimes causes slight affection in the dog; this is cured by daily inoculation of physiological serum under the skin in three or four days.

Researches on the Intestinal Parasitism of the Senegalese Tirailleurs (J. Arlo).—Examinations were made on the stools of a Senegalese battalion staying at Marseilles. The number of persons

¹ The Goulstonian Lectures delivered before the Royal College of Physicians of London, 1923.

infected was great; the duodenal ankylostome was found in 39.02 per cent., and there were 11.08 per cent. cases of *Necator americanus*. The *Trichocephalus* appears to be rare among the natives of French West Africa, and when found it is rarely in association with any other parasite. *Tania saginata* is frequently met with. *Ascaris lumbricoides* and *Oryzias vermicularis* are also rare.

Spirochætal Icterogenic Epidemic observed in Natives of Brazzaville (M. Blanchard, G. Lefrou and J. Legrait).—Fifteen cases are described of the epidemic, which can be divided into two classes: (a) Ictero-hæmorrhagic, similar to amarillic syndrome; (b) pulmonary, of a benign type, and which can easily be mistaken for pneumonia with jaundice.

Blood of the patients containing spirochætes proved pathogenic for guinea-pigs in five passages. Virus of *Cimex lectularius*, taken from the beds of patients, was also pathogenic for the guinea-pig after five passages. This disease was morphologically different from yellow fever.

Leprosy in the Eblova District (Cameroons) (M. Robineau).—Leprosy is one of the most frequent diseases in the Cameroons; in the north it is prevalent in all parts. In May, 1922, the number of lepers in the hospitals of Eblova and the neighbouring districts was 764. Many of the affected natives are free and associate with the rest of the population; it is difficult to get them to enter the leper hospitals.

On a Case of Pulmonary Plague of Atypical Evolution (H. Lheureux and M. Leger).—The authors describe a case of pulmonary plague without any perceptible bubo. The patient entered the hospital at Dakar with symptoms of bronchopneumonia, dyspnoea and hæmorrhagic sputum. Bacteriological examination showed the presence of numerous Gram-negative coccobacilli. For about fifteen days the evolution remained torpid, with very slight fever.

A New Case of Bovine Tuberculosis in the Slaughter-house of Dakar (Nainsouta).—This is the second case observed by the author of tuberculosis in a zebu, and proves that cattle of Dakar are not free from this disease.

Malarial Index of Different Localities of Senegal during the Rainy Season (M. Leger, E. Bédier, A. Baur).—The investigations of the authors show that no part of Senegal is exempt from malaria. The examination of the blood of 703 children gave the following percentages of malarial infection: Kaolack, 85 per cent.; Diourbel, 80 per cent.; Thies, 70 per cent.; Mekhé, 61 per cent.; Tivaouane, 60 per cent.; Sedhiou, 57 per cent.; Fatick, 57 per cent.; Longa, 55 per cent.; Rufisque, 55 per cent.; Bamby, 45 per cent.

Enormous Distension of the Gizzard in a Fowl (Nainsouta).—The lesion was found in a young chicken, which had been killed for cooking, and thrown away on account of a large tumour

observed in the abdominal cavity. The tumour resembled an inflated bag of the size of a fist, membranous, spherical, with here and there pale muscular fasciculi, and in parts showing food. It filled the whole of the abdomen without adhering at all to the walls, and was attached to the gizzard by a short neck. The distension appeared to be due to some long-standing lesion rather than to congenital deformation.

Suggestions for combating Leprosy in the French Colonies (Marcel Leger).—The present regulations for the disease are not satisfactory; they are based on sequestration, but the essential idea should be early treatment. A system of dispensaries with clinical laboratories and hospitals should be provided, and hope of cure should be encouraged.

The different customs of the peoples in the old French colonies, the Asiatic possessions, and the new colonies should be fully regarded and individual freedom respected. In addition, attention should be given to general public hygiene and to spreading information concerning leprosy.

M. Nogue of the Institute of Biology supports these views, but considers that the medicaments in use against leprosy have only mediocre prophylactic action.

Observations on the Trematodes of Indo-China (E. Lagrange).—The author has studied the cercarian parasites of freshwater molluscs in order to determine the life-cycles of the trematodes of man and cattle.

At Nha-Trang (South Assam) and in Central Annam cattle are generally infected with *Fasciola gigantica* and *Paramphistomum explanatum*. Attempts to produce infection by means of cercaria, either by the mouth or through the skin of various animals, gave only negative results.

A full description of *Cercaria amphistomensis* is given.

Anaplasmosis of *Bos brachyccrus* of Angola (F. de Mello and F. Rebello).—In 1916 one of the authors suggested that many of the supposed anaplasms found in the blood might be nuclear residues of normal cells.

The blood of *Bos brachyccrus* now studied appeared to be substantially normal in all respects, but contained on the average one or two anaplasms in each microscopic field. Intracellular and extracellular forms did not differ. Cocciform bodies 0.5-0.75 micron, either separate or as diplococci; coccobacillary forms, separate or paired; oval forms 1-1.5 microns diameter; and ring, halter and crescent forms are described.

BULETIN DE LA SOCIÉTÉ DE PATHOLOGIE
EXOTIQUE, April 11, 1923.

Radiotherapy in the Treatment of Malaria (A. Pais).—Previously X-rays were used in the treatment for malaria with the idea of killing the parasites in the spleen or preventing the development of the protozoa

in the blood, but with unfavourable results, as the leucocytes in an active and integral state and phagocytosis take an important part in the cure of malaria.

The author, by using a new technique, has had very satisfactory results in numerous cases. His method is to excite the hematopoietic organs and not to destroy any living organism. The quantities of rays used are varied according to the reaction of the organism, and sometimes are even weaker than ever used in radiotherapy. This increases the white and red corpuscles of the blood and increases also the opsonic power of the organism. It has a beneficent and rapid effect on fever; it reduces the size of the spleen, and has a very good effect on the general condition of the patient.

An Occult Form of Primitive Hepatic Amœbiasis (G. Fidao).—Ten cases are described of patients suffering from a very bad state of general health but without temperature and definite symptoms; poly-nucleosis, morning urobilinemia and sometimes vasomotor reflex on percussion of the liver was observed. The affection was diagnosed as hepatic amœbiasis, and all the patients were cured in a few days with two injections daily of 0.12 cg. of chlorhydrate of emetin. Morning urobilinemia was also observed in cases of hepatic syphilis, where treatment with emetin was unsuccessful.

Vincent's Angina (W. L. Yakimoff, A. Joukowsky, S. Schirwind).—During the epidemic of Vincent's angina, 1921, the authors observed twelve cases; in eight cases diphtheroid membrane was seen and the other four cases were *angina ulcerosa*. In all cases microscopic examination showed Vincent spirochaetes and fusiform bacilli. Complete cure was obtained by the use of oxygenated water and chlorate of potassium. Three of the cases were suspected of syphilis but the Bordet-Gengou reaction was negative.

Spirochaetosis observed in the Ivory Coast, clinically resembling Yellow Fever (Stévenel).—During 1922 several cases were observed of a spirochaetosis unlike any other described; it cannot be classed with ictero-hæmorrhagic spirochaetosis as the urine of the patients was not pathogenic for guinea-pigs; neither is it recurrent fever as the blood contained eosinophiles. Also the disease described by the author is very deadly and there were no cases of recurrence. It resembles more *Leptospira icteroides* Noguchi, but owing to the rarity and sometimes entire absence of stegomyia in the Ivory Coast, the rôle of vector-agent cannot be exclusively attributed to this insect.

Clinical Remarks on Leprosy in Eblowa (Cameroons) (M. Robineau).—Macular leprosy is the most frequent in this district, and both women and men are equally affected. The shape, number and localization of the macules are very varied, they are also very different morphologically. A *maculo-atrophic* stage often follows macular leprosy; *œdema* begins on the palm of the hands and feet and gradually continues till the whole limb is atrophied and the bones affected; later the cutaneous surface is ulcerated and the

patient is incapable of using his limbs and generally dies in a complete state of marasmus.

Tubercular and pigmentary leprosy is very rare.

Three mixtures for injections have been used without difficulties: (a) Ajouni 60 gr., eucalyptol 40 gr.; (b) chaulmoogra oil 150 gr., alcohol (95 per cent.) 30 gr., sulphuric ether 35 gr.; (c) atoxyl 10 gr., arrhenal 5 gr., water 200 gr. In fifty-nine macular cases thirteen cleared up completely. In fifty-eight cases of maculo-atrophic leprosy thirty-one were greatly improved.

Undulant Fever in Russian Turkestan (L. Yakimoff).—In 1911 two cases of undulant fever were observed in Russian Turkestan by Dr. A. Kramnik, said to be due to infected goats; the agglutination reaction was positive in both cases. In 1913 the Mission of Tropical Diseases tested the agglutination of *Micrococcus melitensis* with the serum of goats; only one of the six serums used agglutinated the micrococcus, which was of Tunisian origin. It is feared that this disease also exists in Persia.

Emetin and Amœbiasis in Egypt (Mme. A. G. Panayotau).—Vedder in 1911 was the first to prove the efficacy of emetin for instantly killing amœbæ, and later Rogers of Calcutta discovered that amœbæ resist a few minutes only in an emetin solution 1,100,000; this has since been confirmed by many other authorities, and chlorhydrate of emetin has become very valuable as a treatment for dysentery and hepatic abscess of amœbic origin.

Official statistics of the Bureau of Hygiene and the Greek Hospital at Alexandria show an enormous decrease in the death-rate due to abscess of the liver and amœbic dysentery since the use of emetin. Microbiological researches show that *amœba* is the cause of 59 per cent. of cases of dysentery in Egypt.

Malaria at Koulack (Delbreil).—Koulack, a small island scarcely above the level of the river, with an ever increasing population, is a centre of malaria due chiefly to stagnant waters, non-hygienic wells and trees that harbour mosquitoes (*Eriodendron anfractuosum*—silk-cotton tree, and *Poinciana regia*—hoabab). Malarial anæmia is very common among children. Natives are rarely affected with the disease, but in the European and Syrian region, malaria is met with in all its forms, the most frequent being the remittent bilious type. Black-water fever is very frequent but of a benign type.

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Original Communications.

THE COMMON OCCURRENCE OF PSEUDO-SPIROCHETES IN THE BLOOD OF BLACKWATER FEVER CASES, AND OF NORMAL HUMAN BEINGS AND ANIMALS WHEN USING THE TECHNIQUE OF BLANCHARD AND LEFROU.

By J. G. THOMSON, M.A., M.B., CH.B.

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PSEUDOSPIROCHÆTES, which, as the name implies, are not true living organisms, occur frequently in blood films, especially those in which the technique has been imperfect. These artifacts occur also in carefully prepared films from the blood of man or animals especially in cases of severe anemia due to malaria or piroplasmiasis. Blood films stained by Giemsa, Leishman or Fontana's methods may show pseudo-spirochætes so similar to spirochætes that inexperienced observers have on several occasions described them as true organisms.

The use of the ultra-microscope in the diagnosis of syphilitic lesions and the examinations of fresh preparations of blood from man and animals show very constantly motile filaments well known to observers accustomed to this work; in fact the dark-ground illumination will demonstrate motile spirochæte-like bodies in practically every specimen of citrated or clotted blood.

Curiously enough, although these motile filaments are well known to those accustomed to hematological researches, nevertheless many workers have from time to time made the mistake of actually regarding them as true spirochætes; and these have erroneously been assumed to be the causal organisms of various diseases, e.g., goitre, &c. As an example of such error Rasch (1920) described these artifacts as the causal organism of psoriasis and named them *Spirochata sporogona psoriasis*. We may here remark that the nomenclature of parasites is quite complicated enough without giving names to organisms which do not exist.

These small filaments in blood specimens are so characteristic that their presence is usually demonstrated to all students now passing through our medical schools.

PREVIOUS DISCOVERIES OF SPIROCHÆTES IN CASES OF HÆMOGLOBINURIC FEVER.

Ashburn, Vedder and Gentry (1912) described in a case of blackwater fever spirochætes identical to those of relapsing fever, and Cook (1913) in Uganda found spirochætes of relapsing fever in five cases of blackwater. Schüffner (1918) found in a case of hæmoglobinuric fever large numbers of spirochætes morphologically identical to *Leptospira icterohæmorrhagiae*, the causal organism of acute infective jaundice, and unfortunately this spirochæte has been named *L. icterohæmoglobinurix*. This case of Schüffner's also showed malarial parasites (*Plasmodium falciparum*).

In 1920 Noc and Esquier reported a fatal case of blackwater fever in which they found numerous spirochætes in the liver: these organisms measured 22 microns to 24 microns in length and were thicker than *L. icterohæmorrhagiae*. In this case *P. falciparum* was also found. More recently we have the report of Blanchard and Lefrou (1922) who, using a special technique employed by Martin, Lebœuf and Roubaud for the detection of trypanosomes, found spirochætes in the blood of two cases of blackwater fever at Brazaville. This technique we shall describe later with the results obtained by me in Southern Rhodesia.

There seems little doubt that Ashburn and his colleagues and Cook described cases of relapsing fever complicated by hæmoglobinuria, and Schüffner evidently described a case accompanied by acute infective jaundice. The spirochæte described by Noc and Esquier, however, we are unable to determine.

The discovery of Blanchard and Lefrou of spirochætes in two cases offers more difficulty, as we have not seen the preparations, but in the absence of an accidental double infection of either *L. icterohæmorrhagiae* or some other species of spirochæte with hæmoglobinuric fever, we are inclined to regard the spirochætes of these latter authors as possibly artifacts. We say this with all due reserve and refer readers to the section of our own findings in Southern Rhodesia.

THE TECHNIQUE OF BLANCHARD AND LEFROU BY WHICH SPIROCHÆTES WERE FOUND IN TWO CASES OF HÆMOGLOBINURIC FEVER.

The method used was as follows: About 10 c.c. of blood is drawn from a vein into a sterile centrifuge tube containing 1 c.c. of a 20 per cent. sterile solution of sodium citrate, and is shaken up to prevent clotting. The blood is then centrifuged three times. The result of the first centrifuge of about ten minutes is to throw down the corpuscles leaving the citrated plasma above. The supernatant plasma is drawn off by a pipette into a second sterile tube and this is centrifuged for at least another ten minutes until there is a light red deposit consisting of red cells, leucocytes and blood platelets. The supernatant fluid of this second tube is decanted into a third sterile tube and subjected to a thorough centrifuging of about twenty minutes to half-an-hour, until a white deposit is seen. This last deposit contains the spirochætes described and consists almost entirely of blood platelets with perhaps an occasional red cell.

In Leishman-stained preparations of this third deposit Blanchard and Lefrou found spirochætes 6 microns to 9 microns long and 0.1 to 0.2 microns broad with three or four undulations. Some of these showed a series of nodosities suggesting the probability of very fine spirals, but, in the absence of the ultra-microscope, the authors were unable to demonstrate these.

In two cases of blackwater out of three examined these authors demonstrated spirochætes in stained specimens. The deposit of the second case when inoculated intraperitoneally into a guinea-pig caused

death in forty-eight hours with distension of the abdomen. Neither jaundice nor hæmoglobinuria were noticed, but a few spirochaetes were found in the liver, which was accordingly emulsified and sub-inoculated into a second guinea-pig. This animal also died in about forty-eight hours with abdominal distension, but again without jaundice or hæmoglobinuria. Spirochaetes were noted in the blood and lungs, but not in the liver. A third guinea-pig was sub-inoculated from an emulsion of the lung of number two, and died in about forty-eight hours without jaundice, but the blood examined shortly before death showed numerous spirochaetes. The post-mortem of this third animal revealed the peritoneal cavity filled with blood, and the bladder contained blood partially hæmolyzed. The kidneys were congested and contained plugs. Subinoculations were continued until the tenth passage, when the strain was lost.

Attempts to inoculate a guinea-pig from the other case proved unsuccessful.

Blanchard and Lefrou name this organism *Spirochaeta biliohæmoglobinurix*, and state that blackwater fever appears to be due to diverse causes of which this spirochaete is one.

THE RESULTS OF OUR INVESTIGATIONS IN SOUTHERN RHODESIA, USING THE TECHNIQUE OF BLANCHARD AND LEFROU.

In view of these results obtained by Blanchard and Lefrou at Brazzaville the same technique was employed in the Laboratory at Salisbury, in fifteen separate cases of blackwater fever from various parts of Rhodesia.

The blood examined was obtained at various stages of the disease, namely, on the first, second, or third days of the onset, and also after the hæmoglobinuria had ceased. In every case the centrifuged deposit of the third tube contained numerous pseudospirochaetes of two types, namely, thick motile filaments varying in length from 5 microns to 9 microns in length, and longer extremely fine filaments very actively motile measuring from 7 microns to 12 microns in length. These filaments correspond in every feature to those seen in clotted blood from normal individuals. These objects have no spiral movement, but appear to be actively motile, wriggling and bending on themselves. They are in reality more or less straight filaments without coils or spirals, but occasionally they have a beaded appearance suggesting a chain of streptococci. When fixed and stained they are often thrown into coils as a result of smearing and drying, thus simulating true spirochaetes, but differing from such in that they do not stain so intensely nor so regularly.

The same pseudospirochaetes were obtained when using this technique in a case of horse sickness kindly supplied to me by Mr. Bevan of the Veterinary Laboratory, Salisbury; and these artifacts occur in practically all specimens of human blood in people enjoying apparently perfect health.

THE ORIGIN OF THESE ARTIFACTS.

Stained films of the resulting deposit of the third centrifuge consists practically of blood platelets only

and an occasional red cell. Stained deposits show numerous filaments radiating from the blood platelets, and there seemed to be little doubt that the long finer filaments originated from these. The stouter filaments originate from degenerate or damaged red blood corpuscles. The motility of these as seen under the ultra-microscope is due to various causes, such as motion of the fluid, medium under the coverslip, changes in surface tension, or possibly to a phenomenon somewhat similar to that which produces the rapid movement in blood dust.

SUBINOCULATIONS OF PSEUDOSPIROCHAETES INTO GUINEA-PIGS.

In the laboratory here we inoculated ten guinea-pigs intraperitoneally with the centrifuged deposits of ten separate cases of blackwater fever. The blood of these cases was taken at varying periods of the disease from the first day to the height of the paroxysm, and after recovery. In such case negative results were obtained; there was no icterus, no constitutional disturbance and no hæmoglobinuria nor hæmorrhages.

Thus we failed to confirm the guinea-pig experiments of Blanchard and Lefrou, who in the third subinoculation obtained hæmorrhage into the peritoneum and partially hæmolyzed blood in the bladder. In all our experimental guinea-pigs we failed to find true spirochaetes, but numerous pseudospirochaetes were demonstrated. We have inoculated fresh whole blood of blackwater fever cases into guinea-pigs with similar negative results. It is interesting to note that Blacklock (1923) injected the blood from a vein of a case of fatal hæmoglobinuria into a healthy European, with negative results.

Dudgeon (1921) in Macedonia failed to demonstrate spirochaetes in hæmoglobinuric fever, using dark ground illumination, Fontana, Levaditi, Giemsa and Leishman stains; the same observer also failed to detect these organisms by centrifuging lysed blood.

We have repeated Dudgeon's experiments with the same negative results, and cultures made by us from the centrifuged deposits of seven cases of blackwater fever into culture media (Wenyon's modification of Noguchi) gave also negative results. Dudgeon failed to find spirochaetes in the urine of 53 specimens of blackwater, and we have also failed to find them in urine at various stages of the disease.

In 1913 Napier favoured the view that syphilis predisposed to blackwater fever, but Barratt and Yorke (1909) and Arkwright and Lepper (1918) found no evidence of this, and more recently Dudgeon (1921) performed the Wassermann test in 25 cases of hæmoglobinuric fever, all of which were negative except two cases who were known to have had the disease.

CONCLUSIONS.

There is at present no proof that any species of spirochaete or even a special species of spirochaete produces or even predisposes to an attack of hæmoglobinuric fever. The whole evidence so far obtained by us in Southern Rhodesia undoubtedly shows in a remarkable manner the relationship of

this condition to chronic malignant tertian malaria (*P. falciparum*), which clinically is of the bilious remittent type with occasional cases of coma.

I should like in conclusion to thank Dr. Fleming, Medical Director of Southern Rhodesia, who made these researches possible. My thanks are also due to Dr. Orpen for his help and encouragement in a series of tedious experiments which only produced negative results.

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INTESTINAL BILHARZIASIS IN THE WEST INDIES: INTERMEDIATE HOST.

By S. B. JONES.

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In a previous communication I indicated the presence of bilharziasis infection with *Schistosomum mansoni* in the West Indian islands of St. Kitts and St. Martin, the former British and the latter French. At that time the species of mollusc which was the intermediate host was unknown to me; but since then I have been in correspondence with Dr. F. G. Cawston, of Durban, Natal, who most kindly interested himself in the matter and to whom I sent specimens of snails taken from the watercourse passing through the village of Colombier, French St. Martin. His identification of the snails points to *Planorbis antequensis*, Reeve, as the intermediate host in French St. Martin.

Seven weeks ago I visited the island of St. Kitts

and through the kindness of the Honorable Clement Malone, Barrister-at-Law, and Mr. C. Thibou, Assistant Superintendent of Public Works, Nevis, I was able to investigate at first hand the probable cause of infection at Boyd's Village, St. Kitts. This was one of those congested villages common enough in the West Indies. With wide spaces all round, the cottages and huts are nevertheless huddled together as if in a town where every foot of land is needed for commercial purposes. It is surrounded by large sugar plantations. In its rear rise lofty mountains, mist-covered for a large part of the time, intersected here and there by deep ravines and gorges, through which in the rainy season small rivulets rush with considerable force to the sea; but in times of drought these form tiny streams, enlarging at intervals into stagnant pools.

Following one of these river beds we found several of these pools where cattle were watered. When of sufficient depth these also afforded a bathing place for the younger people. At one point the stream was dammed and the water piped to the neighbouring sugar estate in the plain below for the purpose of watering cattle and horses. It seems also that estate labourers drink this water at times. In this small reservoir, as elsewhere along the whole course of the stream, there were swarms of snails, one of the species of the Planorbidae. The infective host at Boyd's Village, St. Kitts, is therefore likely to prove to be a snail, one of the Planorbidae, sp. *antiquensis*, Reeve, doubtless. Infection is conveyed through bathing in the stream and pools and probably also by drinking of the water. It is regrettable that time did not allow of the examination of the water and some of the snails for cercariae.

A night voyage by steamer brought me next day to Antigua, some forty miles distant, and with the kind assistance of Mr. Richard Pigott, a merchant of St. John's, who took a keen and intelligent interest in the subject, I was able without any delay to make a cursory survey of the southern portion of that island. The southern portion of Antigua is occupied by volcanic hills which form a watershed for several streams which become partially stagnant pools in the dry season. Water-lilies were numerous in the streams at Bath Lodge, Bandal's and Body Pond. An abundant supply of a species of *Planorbis* snail was present in the mud or on the leaves of the water-lilies. The village children told of bathing in the stream at Bandal's.

Most important of all was the visit to Body Pond's Dam. For the purpose of supplying water to the city reservoir five or six miles distant, to which it is pumped by air motor or steam power, a dam of splendid mason work has been placed across the stream. To all appearances the watershed is carefully looked after by prison labour; but around the edge of the enclosed water were to be seen myriads of a species of *Planorbis* snail, probably *antiquensis*, Reeve, emitting the characteristic odour of decaying snails.

Whether or not there are any persons living in Antigua at the present time suffering from intestinal bilharziasis through infection with *S. mansoni*, I was

unable to discover in my brief visit; but it is evident that any such persons living in that portion of the island are apt at no distant date to create a serious problem in tropical hygiene. The whole setting is present at this moment for a frightful tragedy. Nor is cause for grave apprehension groundless, since it was a case of intestinal bilharziasis in a gentleman from Antigua which led the late Sir Patrick Manson to be the pioneer in the series of brilliant investigations into the causation and treatment of this dreaded disease.

A week later, being in transit to the United Kingdom via French St. Martin, Porto Rico, Santo Domingo and the United States, I was present in Santo Domingo City on the day when Dr. Porfillo, a professor in the University of Santo Domingo, announced in *Listin Diario* of date June 5 his discovery of *S. mansoni* in that island, especially in the Barahona district, a district not without its social and economic interest for persons from the British West Indies. For it is the district which promises to be the largest sugar producing section in the whole of that republic. A vast irrigation scheme is in operation to supplement its scanty rainfall. The labour supply for reaping the canes is drawn largely from the British West Indies. A year ago several of the British West Indian labourers from Anguilla were reported to be dying from a strange intestinal disorder. In view of Dr. Porfillo's absolute microscopic confirmation of the presence of infection by *S. mansoni* in the Barahona district of Santo Domingo, it is not a rash conclusion that, while some of these cases may have been true tropical dysentery of one form or another, others may have been fatal cases of bilharzial dysentery.

SUMMARY.

Intestinal bilharziasis is threatening to destroy the vitality of the inhabitants of the West Indies, both white and black. It is present in Guadeloupe, French St. Martin, St. Kitts, probably Antigua, and in Santo Domingo and Porto Rico.

The mollusc which serves as the intermediate host in French St. Martin and probably in St. Kitts also is one of the Planorbidae, sp. *antiquensis*, Reevs.

It is fair to assume that wherever West Indian islands contain small streams or rivers which are likely to dry up and become stagnant pools in times of dry weather, and at the same time one or more species of the snail Planorbidae is present, the disease if not now in existence, will be introduced in time through the movement of population from one island to another.

The prompt treatment of all infected cases, in conjunction with the eradication of all species of the snails Planorbidae from the streams, are public health problems which should engage the attention of all West Indian Governments, irrespective of nationality.

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VARIOUS ASTRINGENTS IN USE IN INTESTINAL FLUX.

SEVERAL compounds, some of them recently introduced, are being used as astringents in cases of gastric, duodenal and intestinal catarrh, especially when those

is chronic in character; one of these, "Collosol kaolin," is making, and will in all probability continue to make, its mark in practice, whilst the oldest established of this group of "steadiers" of the digestive track—bismuth—is rising in favour and in the bulk of its dose. Time was when subnitrate of bismuth was well-nigh the only preparation within the ken of young practitioners, and its dose was limited to a small precise number of grains; there being a dread of increasing the quantity beyond some 10 grains, a fetish which still is attached to its administration.

In the tropics, especially in the Far East, "Sys" powder has for some 40 years been in extensive use and will be discussed later. Ulcers in the gastro intestinal tract are to-day coming to be treated in much the same way as ulcerations of the skin are dealt with by the surgeon. One of the best known of our astringent mixtures, in earlier days, was *mistura creta*—the chalk mixture of our pharmacopœias. It consists of 3% chalk with 6% sugar and "a little" tragacanth, kept as a dry powder and administered with cinnamon water. Frequently opium is added to the mixture in the treatment of arrhœa. There has come about during the past few months however a great advance by the introduction of kaolin, the China clay so much in use by the potter in China. The finest of clays known, it has taken a long time to find its way into the pharmacopœias of Europe, and only when prepared as a collosol has it attained a medicinal form of a commanding position. Its virtues in China have been recognized from time immemorial as a medium in the manufacture of the finest example of china, the "blue and white" varieties being valued for the whiteness of their basis and the absence of impurities. The impurities are characterized by the presence of "flames." These are to be seen in the shape of spots scattered throughout the material of the plates, cups, jars, &c., by which the lower grades of china are disfigured. The kaolin of China, known elsewhere as "fuller's earth," forms in many parts of China the clay soil that clings to one's boots on taking a walk in, say, Hong Kong, around Canton, and many other districts of China. Little does the average European appreciate the fact that the mud "he wipes from his boots and clothing is, in many instances, of high value, from which the most beautiful works of art known to man are made and adorned. In estimating "blue and white" articles of pottery the essential test is that the blue shall be blue and the white shall be flawless in its freedom from "spots" and shall be white in its intensity. The purity and the high price of the Chinese works of art show that even the Chinese find difficulty in purifying the kaolin basis in which they deal so largely, and for medicinal purposes many of their specimens are defective; made as a collosol this is avoided, and as a pure drug perhaps there is none better calculated to be a safe and effective mechanical powder of a lime salt than the kaolin, which has never been produced as a collosol.

"Sys Powder" or "Sys Specific," as it is sometimes termed, was introduced by the late Peter Sys

of Shanghai; he brought it with him from the Batavia district of Java, and many sufferers from sprue, colitis, and chronic dysentery from different parts of the Far East consulted him. When he died the "secret" was taken up by a Company and under the name of "Pulv. Batavia co." and "Pulv. os Sepia" has been used in Britain, being chiefly prescribed by the late Sir Patrick Manson and the writer. That it can render the fluid sprue stools solid is undoubted, that it checks the fermentation and the acidity of these stools is a fact. The powder is made from the dried cuttle-fish bone which is found in quantities on the sea shores of Java. The odour of the powder when the bottle containing it is opened is undoubted, and it may be that the source of the powder has a specific action unobtainable from other sources such as kaolin or other chalks. There is, however, some difficulty getting the preparation carried in a sound condition, as the long sea voyage from China to England entails. "The cuttle-fish bone" or shell or os sepia, has a chitinous basis, but most chemists declare it to be merely a lime salt, and that there is no organic material in it. Be that as it may, the fishy odour justifies the belief in its source. The chief constituent consists of 80 to 85 per cent. of carbonate of lime, a little common salt, phosphate of lime and 10 or 15 per cent. of organic matter. Fullers earth is not so pure as kaolin, although the two are often spoken of as if synonymous, yet kaolin is the purer and the collosol the purest form of all.

The function and purpose of the salts, be they aluminium salicylate, that is to say clays or the non-poisonous metals such as bismuth and barium, so much used in X-ray work, connected with the alimentary tract, have largely mechanical uses when given in case of ulcers of the stomach, the duodenum, the small or large intestines of late have drawn attention to the benefits derived from their mechanical effects. In many an X-ray picture in cases of photography of the stomach, duodenum, &c., beneficial results have been ascribed to the procedure, and the patient not infrequently ascribes the improvement to the X-ray picture. "It is a curious thing, doctor, that I am much better since I had the X-ray applied." They ascribe the benefit to the "ray," never thinking that the local mechanical effects by the coating of the ulceration by the clay is the true cause of the "cure." In cases of the kind and before the bulk of the salt was proved to be possible to administer in huge bulk and do good by its bulk precipitation on the raw mucous surface of the canal, we used bismuth subnitrate in restricted doses, but experience has shown that we can give oxychloride of bismuth in large quantities in X-ray work. The good it does is that the part is coated by the mechanical deposit of the salt so that the ulcerated surface is protected from the fluids of the defective tract and under its thick protection the deep surface can heal as does the ulcer on the skin heal after filling it up by calomel and keeping it on for days or weeks.

The kaolin used in large quantity does the same thing, but its purity owing to being passed through a

collosol state is safe to be given, and we now may be said to possess a safer covering to the raw surface met with in the alimentary tract. Instead of these insoluble powders several oils are administered with the same idea before one, namely, the covering of the raw surface by liquid paraffin or emulsion of paraffin and bismuth. In gastric ulcer, pyloric tenderness, delay and precipitation of bismuth is favoured by its being administered with powdered gum acacia, but constipation must be guarded against and a teaspoonful of castor oil with or without five or six drops of laudanum given twice a week. The real god of preventing a diarrhoea by collosol kaolin, "Sys" powder or some one of the bismuth compounds is undoubted. Time was when checking diarrhoea was condemned as unscientific; it was like applying a cork to the anus and condemned accordingly. The writer has given castor oil with a few drops of laudanum for many cases of chronic oolitis or whatever name is given to the intestinal flux which so frequently follows administration of emetine in amebic dysentery. With ipecacuanha treatment we used not to see post-dysenteric diarrhoea or colitis as occurs nowadays after emetine injections alone. Experience of the writer with this treatment by clay, that is, kaolin, and by carbonate of lime, that is by "Sys" powder, by causing the faeces to become solid and bulky, shows that the constipation that results is apt to cause an intestinal flux oozing from the bowel wall and causing a spurious weeping diarrhoea which cause the patient to think that a relapse or recurrence has taken place. This the writer prevents by regular (say twice a week) administration of teaspoonful doses of castor oil and twice a week washing out the lower bowel by $1\frac{1}{2}$ pints of warm "sea water."

J. CANTLIE.

Annotations.

Survey of Biting Insects of Assam with Reference to Kala-azar for the whole Year from November, 1921, to October, 1922 (P. R. Awati, *Indian Journ. Med. Res.*, vol. x, October, 1922).—An investigation was made, in two areas of Assam, of the biting insects which affect human beings, with a view to gaining light on the aetiology of kala-azar. One area was free from the disease and in the other it was endemic. In both the infected and uninfected areas bed-bugs appear to be equally distributed, but their number is much greater during the dry season, probably owing to the high continued temperature and the humidity. Pediculi are more numerous in the uninfected area than in the infected area, and their incidence is the same in both seasons. *Conorhinus rubrofasciatus*, the Reduviid bug, is found in the infected area all through the year. Sand-flies, ticks, mites and fleas occurred in both areas. Mosquitoes do not breed in the storage vessels, as the water is only stored in the house for about twenty-four hours.

Case of Kala-azar Treated with "Bayer 205" (W. Mollow, *Arch. f. Schiff-u. Trop.-Hyg.*, vol. xvi, 1922).—The patient contracted the disease in Macedonia, it was first thought to be malaria but quinine was found to have no effect. When the diagnosis of kala-azar was made he was in an advanced stage of the disease. An injection of 0.2 gm. of 205 given intravenously was followed twenty minutes later by a violent rigor and elevation of the temperature to $103^{\circ}8'$ F. The symptoms were getting more intense but consciousness was completely retained. There was a little improvement at night, but at midnight delirium set in and the patient died at 4.30 a.m., sixteen hours after the injection.

Puncture of the liver and spleen soon after death revealed numerous leishmania in the smears.

Calomel Treatment in Obstinate Amebic Dysentery (G. Beijnen, *Nederl. Tijdschr. v. Geneesk.*, vol. lxi, 1922).—The author recommends calomel in doses of 0.03 gm. twelve times per day for three days, followed by three days' treatment with bismuth subnitrate (0.5 gm. twelve times), in cases where the usual treatment has no effect. In one case quoted by the author, thus treated, there was definite disappearance of the amebæ; another case showed good clinical results, but there was relapse after three months.

Plague in Manchuria (W. L. Teh, G. L. Tuck, C. W. Han and R. Pollitzer, *Jour. of Hygiene*, vol. xxi, No. 3, May, 1923).—It was found that the *B. pestis* present in plague sputum, although more resistant than *in vitro*, was killed within nine hours by direct sunlight at a winter temperature (-3° C.).

Mere drying of plague sputum, irrespective of other factors, e.g., temperature, humidity, is not a sufficient test of the killing of *B. pestis* under all circumstances. *B. pestis* has been cultivated from seemingly dry sputum in 40 per cent. cases after exposure in Petri dishes to sunlight, and in 60 per cent. cases when exposed upon wood or surgical gauze.

Disinfectants and antiseptics, even in strengths above those usually recommended, have not the generally expected results upon plague sputum. For instance, carbolic acid lotion, 1-10, requires five minutes to prevent growth of *B. pestis* in sputum. Concentrated alcohol (methylated spirit) is the surest means of sterilizing the hands and gloves in plague work.

Rooms where patients have died of pneumonic plague do not seem particularly dangerous. A modern-built, steam-heated room, with tightly fitting windows and protected from draughts, appears more dangerous than old-fashioned native houses.

The disinfection of grossly contaminated articles, like floors, walls, &c., is necessary. The problem of fumigation of the air-contents remains an open one.

The infectivity of clothing as a means of propagating pneumonic plague cannot be neglected.

The existence of plague carriers has been proved in the 1921 epidemic.

The Mukden cotton-and-gauze mask, when properly applied, is the best means of personal protection against infection by inhalation. For those in contact and immediate contact with patients, we would advise the wearing of an additional hood with silk-jeice sewn on in front, besides the use of goggles.

Pigs and birds were found to be non-susceptible to highly virulent fresh material.

Treatment of Kala-azar by Stibenyl (Jules Renault, Jonier-Vinard and G. Gendron, *Bull. et Mém. Soc. Méd. Hôpit. de Paris*, No. 34, 1922).—The authors describe a case of kala-azar occurring in a child at Iarseilles. Stibenyl was injected intramuscularly and intravenously and resulted in a complete cure after seven months. Injections were given every three days during the first three months, and every two days for the rest of the time. Doses varied from 0.05 to 0.2 gm.

Infantile Kala-azar at Messina (Giuseppe Castorina, *Pediatrics*, vol. xxx, No. 24).—Forty-four cases of infantile kala-azar were treated at Messina between October, 1921, and September, 1922, of which seven died, twenty-four were cured, seven are still under treatment, and six were lost sight of. Treatment consisted of tartar emetic given intravenously.

Case of Oriental Sore Treated with Antimony (Gaston and Tissot, *Bull. Soc. française de Dermat. et de Syph.*, No. 1, 1923).—The authors describe a case of Oriental sore which had been unsuccessfully treated with intravenous injections of ioversenobenzol and local injections of emetine hydrochloride. The administration of antimony by intravenous injections and local injection of salts of antimony resulted in a complete disappearance of the disease.

Biologic Reactions of Arsphenamine (J. Oliver, S. Yamada and F. Kolos, *Archives of Dermatology and Syphilology*, vol. viii, No. 1, July, 1923).—The combination of arsphenamine with hydrophil colloids reduces the toxicity of the drug. Gelatin is the most effective in this regard of the colloids examined. The decrease in toxicity is a general one as shown by the facts that (1) The physical toxicity of arsphenamine is removed; (2) the chemical toxicity reduced to three-fifths; (3) the circulatory disturbances following its administration are markedly lessened.

Rare Case of Recurrent Herpes (Hugh Grant Howell, *Archives of Dermatology and Syphilology*, pl. viii, No. 1, July, 1923).—The author describes a case of herpes occurring in a boy aged 12. He had had a similar attack six years previously but had no trouble since. He first noticed the recurrence

three days previously, when there was itching on his face, and on putting his hand to that particular region it felt rough, and as if it had pimples. When the lesion was first seen by the child's mother it was merely red, and the vesicles appear from twelve to twenty-four hours later.

The skin lesion covered about $1\frac{1}{2}$ to 2 in. in the middle third of the lower jaw on the right side. The area was swollen and porky, and was covered with vesicles varying in size from that of the head of a pin to that of a split pea. In the centre, the lesions had coalesced, one area near the centre showed slight crusting, with bluish discoloration. The skin between the vesicles and at the periphery end was red. There was a distinct line of demarcation. Palpation revealed no adenopathy.

No cause could be found except that the boy always wore khaki flannel shirts, the collars of which frequently rubbed this portion of his face. The temperature was 99° F.

The affection was completely cured by the application of zinc ointment.

Chronic Splenomegalic Hemolytic Jaundice (Jacob Meyer and Isadore Pilot, *Journal of the American Medical Association*, vol. lxxx, No. 24, June, 1923).—A streptococcus similar to *Streptococcus viridans* was isolated from the spleen of a child aged 7, who presented the clinical picture of chronic splenomegalic hemolytic jaundice. Mild and severe infections may initiate as well as aggravate the symptomatology of this disease. On removal of the spleen, recovery took place, and the subsequent development of an acute influenza was not accompanied by any evidence of hemolytic activity.

A Milk-Borne Epidemic of Septic Sore Throat in Portland, Oregon (R. L. Benson and H. J. Sears, *Journal of the American Medical Association*, vol. lxxx, No. 22, June, 1923).—It is evident from the data obtained that this epidemic, with 487 cases and twenty-two deaths, was caused by the drinking of raw milk from one dairy, which had been rated as one of the best in the city.

Similar strains of hæmolytic streptococcus were obtained in almost pure culture from the inflamed udder of a cow of the herd, from one milker's throat, and from the throats of numerous septic sore throat patients and contacts. All these strains were shown to be of the human type.

It is probable that the milker in question infected the udder of the cow, producing purulent mastitis; that, on one or more occasions, this cow was milked in with the herd, and that the massed infection thus produced resulted in the epidemic.

This cow's udder had both human and bovine strains of hæmolytic streptococci. One quarter, containing a human strain, had a massive mastitis indistinguishable grossly from garget; another quarter, having a bovine strain, was only slightly consolidated.

Urticaria Caused by Light (W. W. Duke, *Journal of the American Medical Association*, vol. lxxx, No. 25, June, 1923).—The author reports a case which is interesting in that a woman with a family history of allergy spontaneously became so sensitive to light that on exposure of the skin to the direct sunlight of a winter month for two and a half minutes typical itching hives, associated with erythema of the skin, invariably appeared over the entire area exposed. The reaction differed from the urticaria of allergic individuals after contact with substances to which they are hypersensitive only in the fact that it had no tendency to spread with pseudopod formation beyond the area exposed to the irritating agent. This reaction was produced only by the blue violet rays of light.

Constitutional symptoms were felt on two occasions when a large area of skin was exposed to light.

A considerable degree of tolerance was developed by repeated exposure of the small areas of the skin to light. The tolerance gained in this way, however, was lost after a comparatively short time, so that this method of treatment did not appear a rational remedy for the condition.

Efforts to produce hives in this patient by agents other than direct exposure to light failed except in two instances, namely, by the intracutaneous injection of serum which had been treated with hematoporphyrin and exposed to sunlight, and by the intracutaneous injection of hematoporphyrin followed by exposure of the injected area to diffuse light for a short time.

This case may be an example of allergy caused by specific hypersensitiveness to a substance produced in the tissues under the influence of light. Further study will be directed toward clarifying this point.

Resin Dermatitis (L. G. Beinbauer, *Journal of the American Medical Association*, vol. lxxx, No. 1, July, 1923).—Occupational dermatoses are more common than usually thought. Occupational dermatoses are almost always mistaken for, and treated as, an "eczema" or "dermatitis" in a routine way. Resin is capable of producing a dermatitis. Treatment consists of the removal of the cause, which is by far the most important factor in obtaining a cure.

The Precipitin Test in the Diagnosis of Syphilis (V. H. Moon, *Journal of the American Medical Association*, vol. lxxx, No. 21, May, 1923).—The precipitin test performed by the ring method described by Herrold gives confusing results on turbid or lipemic serums.

Antigen containing 0.4 per cent. cholesterol occasionally gives a positive precipitin reaction with serums from non syphilitic patients.

The precipitin test under proper conditions is more sensitive than the Wassermann test, in that the serums from known syphilitics which give a negative Wassermann reaction will often give a positive precipitin reaction.

Careful work must yet be done to determine the optimum conditions of performance to obtain maximum sensitivity with no false positives.

So many variable factors enter into the manipulation of the antigen that, in order to secure reliable results, the test must be performed by serologists in experience. It is not a simple test to be used by physicians in practice or by unskilled laboratory workers.

Bacillary Dysentery (Robert Cutter, *Journal of the American Medical Association*, vol. lxxx, No. 23, June, 1923).—A study was made of a laboratory infection with *Bacillus dysenteriae* (Flexner). The incubation period was twenty-eight hours. The duration of the disease was thirty-six hours. The carrier state lasted two weeks. Examination of only two consecutive negative stools is unreliable as a criterion for release from quarantine. Study of the intestinal bacteriophage showed lytic action present in the stool filtrate from the fourth to the ninth day after onset, but no longer demonstrable by the twenty-first day.

Carbon Tetrachloride in the Treatment of Hookworm Disease (S. M. Lambert, *Journal of the American Medical Association*, vol. lxxx, No. 8, February, 1923).—Carbon tetrachloride has shown itself to be the best vermifuge for the treatment of hookworm disease in a country where *Necator americanus* predominates.

The drug is palatable, requires no preparation on the patient, and, when pure, is apparently not toxic—all of which features are of advantage in a popular campaign.

Forty-two thousand people were treated without morbidity or mortality from the drug. Among 8,000 cases subsequently treated with supposedly pure carbon tetrachloride, three fatalities occurred. Chemical examinations, however, disclosed that this particular lot of carbon tetrachloride was far from pure, which emphasizes the necessity for a pure supply of this drug.

It is possible that a dosage of 3 minims (0.2 c.c.) for each year of age with an adult dose of from 45 to 60 minims (3 to 4 c.c.) is larger than is desirable.

Lichen Nitidus (H. E. Michelson, *Archives of Dermatology and Syphilology*, vol. vii, No. 6, June, 1923).—The characteristics of lichen nitidus are as follows:—

The lesion is a sharply defined granulomatous mass of various shapes made up of small round cells, epithelioid cells, fibroblasts and giant cells in varying numbers.

The lesion is always entirely beneath the epidermis. There is no necrosis. Causative organisms have not been identified as yet.

Clinically the lesions more closely resemble minute lichen planus papules. The lesion produced by the plane type of lichen scrofulosorum is the one which most closely resembles lichen nitidus histologically.

Lichen Nitidus (W. B. Trimble and E. R. Maloney, *Archives of Dermatology and Syphilology*, vol. vii, No. 4, April, 1923).—*Lichen nitidus* is a distinct disease entity, characterized by multiple minute discrete skin-coloured papules of widespread distribution, giving rise to no subjective symptoms.

Histologically, the lesion presents the picture of a granuloma.

From the histologic findings and from the positive reaction to tuberculin in several cases, it is probably due to a tuberculous toxin.

Treatment has very little, if any, effect on the condition in most cases, the lesions disappearing either entirely or in part without treatment, probably owing to the fact that the individual acquires an immunity to the toxin.

Clinical Note on Leukoderma Acquisitum Centrifugum (Sutton) (J. H. Stokes, *Archives of Dermatology and Syphilology*, vol. vii, No. 5, May, 1923).—*Leukoderma acquisitum centrifugum* (Sutton) is a special type of depigmentation of the skin, which, although of little importance from the standpoint of general health, is of sufficient interest clinically to deserve separate description.

This type of depigmentation is associated in a great proportion of cases with pigmented nevi, and appears as an oval or circular halo of depigmentation around the darker central punctum, papule, nodule or tumour.

Rings of faint depigmentation, not associated with regression or involution changes, were seen around papules in one case of psoriasis and in one of sarcoid with papular lesions.

Bullous Eruptions in Hæmorrhagic Sarcoma of Kaposi and in Lichen Planus (by F. Wise and J. J. Eller, *Archives of Dermatology and Syphilology*, vol. vii, No. 5, May, 1923).—The authors describe a case of hæmorrhagic sarcoma in a female patient in which bullous lesions formed a part of the general eruption. The bullæ in this case were caused by a mechanical lymph-stasis, and were therefore not elementary bullous lesions in the strict sense. The occurrence of the disease in the female is extremely rare, not more than seven or eight examples are recorded in the world's literature. In the male hundreds of cases have been published.

In lichen planus, vesicular and bullous lesions are not so rare, but rare enough to justify the publication of well developed examples.

Separations of the Toxins of Bacillus Dysenteriae Shiga (by James E. McCartney and Peter K. Olitsky, *Journal of Experimental Medicine*, vol. xxxvii, No. 6, June, 1923).—By the suppression, through anaerobiosis, of the exotoxin-producing activity of *Bacillus dysenteriae* Shiga a pure endotoxin is produced directly from the culture. The duality of the poison of Shiga bacillus is further substantiated by studies on the diffusion of exotoxin, or neurotoxin, and endotoxin, or enterotoxin, by means of collodion sacs, implanted intra-abdominally in rabbits or placed *in vitro*.

Abstracts and Reprints.

LACQUER DERMATITIS OR DERMATOSIS INDUSTRIALIS (PAPULO-VESICULAR LACQUER).¹

By JAMES T. WAYSON.

PUSEY'S recent article on lacquer dermatitis and Lane's articles on the more accurate classification of industrial skin diseases and industrial dermatitis in general, are the incentive of this article on lacquer dermatitis as seen in one of the largest pineapple canneries in Hawaii, wherein 1,527,948 cases, averaging twenty-four cans each, were turned out during the season of 1922. At this cannery, every can passes through a hot bath of one part commercial lacquer and five parts gasoline.

The clinical appearance of the dermatitis caused by this mixture is so in accord with Pusey's description that it has been classified as lacquer dermatitis without question, or to use Lane's classification, dermatosis industrialis (papulo-vesicular lacquer). It is possible that the gasoline may add to the skin irritation, but it is thought that the lacquer is the direct cause. In rare instances, an acute conjunctivitis occurs without an accompanying dermatitis of the exposed skin. This, in my judgment, is due to the vapour arising from the heated gasoline, as Weber states that the irritant substance or poisonous element of the *Rhus vernicifera* (Japanese lacquer) used here contains the same poisonous element found by Pusey and Weber.

The skin of those who are susceptible becomes irritated when handling the cans long after they have become thoroughly cooled, but the result is a much milder dermatitis (rash only) and lasts a few days. Those who become affected from handling the cans as they come from the hot bath usually undergo three stages: first, the skin becomes red, greatly irritated and swollen, somewhat resembling a scarlet fever rash with, at times, severe itching. The first stage lasts on an average for forty-eight hours, and is followed by the second stage—an increased swelling of the affected parts and development of the papulo-vesicular eruption—which may remain for ten days or two weeks, finally to undergo a period of desquamation, which is the third stage which lasts several days. The more elderly labourers seem to be the most susceptible, although all who are exposed are likely to be affected. If on the first appearance of the early rash the patient is removed from exposure at once, the case usually runs a mild course, although a small percentage of persons may undergo a severe attack at a minimum exposure. The wearing of gloves while at work has reduced the number to a low percentage. As a routine remedy, a bland ointment has proved the most successful, so far even better than the wet dressings of aluminum acetate solution, as recommended by Pusey.

¹ Abstracted from *Archives of Dermatology and Syphilology*, vol. viii, No. 1, July, 1923.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE
EXOTIQUE, April 11, 1923.

The Action of Vegetable Latex on Different Protozoa. Culture of Trypanosomes in Latex (G. Franchini).—This is the second note of the author's on the action of latex on different trypanosomes (see *Bull.* No. 1, 1923). The trypanosomes used were *T. equinum*, *T. pecaudi*, *T. marocanum*, *T. rhodesiense* (all taken from the blood of mice), *T. cruzi* (from the blood of guinea-pig) and *T. lewisi*. From these experiments it is found that the human trypanosomes live longest in latex. Latex of *Asclepias curassavica*, *Gomphocarpus fruticosus* and an undetermined *euphorbia* are not at all favourable to the preservation of the protozoa, but in *Tanghinia venenifera* (Apocynum), in which bacteria do not grow, the protozoa live a long time. *Crithidia* and *Leishmaniforms* grow abundantly and vary in dimensions according to the latex used. *T. lewisi* is cultivated with more difficulty than *T. cruzi*.

It has been observed that the trypanosomes live much longer in latex than in physiological solution or citrated solution. Amœbæ of the intestine do not resist the latex long, but lamblia are found living several months after sowing; the cysts of human lamblia are the most resistant.

The author suggests that several latex could take the place of broth and gelose as media for the cultivation of bacteria and bacilli of the human intestine.

Note on Bacteriological Technique. Orticoni's Method (W. L. Yakimoff).—In using Orticoni's media (1915) for diagnosis of typhoid and paratyphoid bacilli, ordinary broth 1000 c.c. and glucose 2.5 is sterilized for half an hour at 105°. When using, 100 c.c. is poured into a balloon, 2.3 c.c. of filtered sterilized ox bile is added and 10-15 c.c. of the blood of the suspected patient. The whole examination is done in twelve hours, whereas with ordinary methods the culture on bile takes eighteen hours; further, the differentiation of the microbes which takes another 18 to 24 hours, is not necessary at all with Orticoni's method. The bile causes the bacilli to be easily perceived, while the glucose differentiates the typhoid from the paratyphoid; the paratyphoid bacilli ferment the glucose, and their presence is revealed by the appearance of gas-bubbles on the surface of the media.

A large Naso-pharyngeal Fibroma (G. Hudlet).—A description is given of an indigen of Dakar, aged 25, suffering from blindness and deformation of the face. The first symptoms of the affection were persistent epistaxis and great difficulty in breathing due to obstruction of the nasal fossæ by fleshy masses. Eight months later deformation began by the sinking in of the root of the nose, both eyes were pushed outwardly, and eventually the patient became completely blind. Operation was performed. A large tumour was found which occupied the nasal fossæ, the vault of the mouth, the maxillary sinuses, the etheroid cells and

the spheroid and left frontal sinuses; it was identified as a fibroma containing in parts masses of sarcomatous cells.

Malaria of the Adult Native of West Africa. Parasitological and Clinical Study (M. Leger and M. Nogue).—Much has already been written on the immunity from malaria of the natives of Africa. Researches made by the authors show adult natives to be carriers of hæmatozoa of malaria in the peripheral blood, and in a much larger proportion during the rainy season than in the dry season (47 and 7 per cent. respectively). The percentage of children infected is greater (64 and 36 per cent.). *P. praecox* and *P. malaria* are the agents, the former being most frequently found, but *P. vivax* was absent in all cases. Patients between the ages of 20 and 60 were found to be infested in more or less the same proportion; this differs greatly from data of other authorities who believe the adult to be almost immune from the disease.

Index of Bilharzia in Children of Dakar (M. Leger and E. Bedier).—Examination of the urine of 127 boys at Dakar showed 6.3 per cent. infested with *Schistosomum hæmatobium*; eight cases showing trematode ova. Of sixty-eight children of Medina (near Dakar) examined, 38.8 per cent. were found to harbour eggs of *S. hæmatobium*, some in great numbers. Many of the children have never left the country.

These facts show that the parasite infestation is carried on in the place itself, and it remains to be seen which are the molluscs which act as intermediary hosts.

Trypanosoma nixæ kohl-kakimov (W. L. Yakimoff).—This trypanosoma is a new species of Russian origin. The affection it causes sometimes resembles *surra* and sometimes *debab*, at other times the symptoms have been totally different. The following is a comparison of the three types as given by the author:—

	Russian tr.	<i>Tr. evansi</i>	<i>Tr. soudanense</i>
Camel ..	Œdema	Œdema	No œdema
Horse ..	No œdema	Œdema	Very little œdema
Bovide ..	No cases of death	Mortality— 25-30 per cent.	?
Sheep ..	Death	Sometimes	Death
Goats ..	Death	Recovery	Often recovery
Pigs ..	Death	?	?
Dogs ..	Œdema	Ocular troubles	No œdema, ocular troubles
Rabbits ..	No œdema	No œdema	Œdema

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Original Communications.

MALARIA OF THE MIDDELVELT AND HIGHVELT OF THE TRANSVAAL.

By H. A. SPENCER, M.R.C.S.Eng., L.R.C.P.Lond.
District Surgeon, Middelburg, Transvaal.

DURING the summers of sparse rainfall over the Transvaal, a few weeks after malignant malaria has become epidemic over the Lowvelt, this infection also appears sporadically over even the highest parts of the Middel- and Highvelts.

It invariably makes its appearance amongst the natives first, wandering as they do long distances all over the country and probably convey the infection from the Lowvelt in this manner. It quickly spreads amongst them and thence into the houses of their European employers. "Ordinary malaria"—benign tertian infections—is always unusually rife in such seasons and a farmer takes little notice of the absence of a few of his natives from work at such times, but when, a few days later, none of them put in an appearance, he finds that nearly all, in a small kraal of half a dozen huts and between twenty and thirty natives with their wives and children are lying very ill, two or three of them having died already. He reports to the magistrate that "some sort of sickness has appeared amongst his natives, of which some have already died," and upon arrival of the district surgeon at his farm the farmer himself, with perhaps his wife and some of his children, are also laid up with it and more of his natives have died. The general complaint is of pain and discomfort in the abdomen, chest and head with feverishness, but all the Europeans are at once seen to be bile-stained, whilst the conjunctivae of the natives are yellow also, and it is recognized that the sickness is malignant malaria, similar in every way to the epidemic spreading far and wide over the Lowvelt at the moment. Quinine is at once served out all round and the sickness soon commences to abate, but the farmer scouts all idea of its being anything in the nature of malaria, saying that this sickness is nothing like it! I have never been able to substantiate the probability that malignant infection is conveyed direct from the Lowvelt by convalescent or previously affected natives in spite of efforts to do so, but it is quite possible considering the wandering nature of the natives, the impossibility of learning about visitors to their kraals and their suspicions at any such inquiries. But this is not the usual malarial infection of the Middel- and Highvelts, every summer benign malaria is more or less rife on every farm in these parts, where none is protected with wire gauze and mosquito nets are scouted; so in every homestead cases of fever and headache occur at intervals all summer, they apply a few homely remedies (take quinine if they have any), lay up for a few days and are soon about again—until reinfections cause recurrences again and again; but as the years go by the attacks become milder until anything in the return of an attack ceases, for they are developing immunity—to the irritation of the toxin. And these are the people who, instead of suffering from acute attacks of malaria,

now develop chronic malaria only. They say, in connection with advice upon the prevention of the acute attacks, that malaria has always been there, they believe that it always will be there, that the only thing to do is—not to prevent it—to get used to it, and they illustrate this possibility by pointing to those about them who used to suffer from acute attacks but have not done so for years now. They do not connect the chronic rheumatism, the periodical headaches, the chronic coughs (bronchitis they call it), the abdominal pains from enlarged spleens, the thin wasted frames with yellowish complexions, the weak sight from anaemia, from some or perhaps all of which these people, who are now free from malaria, suffer every summer and through most of the winter, and from one or other of which they ultimately die—they do not connect any of these conditions with malaria; they tell you that these conditions are characteristic of that part of the country and are due to altitude, to dryness of the atmosphere on the Highvelt, to the cold winds of winter and the chill of living near the large open lakes (Pans and Vleis they are called), even to diet; but whatever treatment it is necessary to give these people quinine tinctoids have to be given with it, and they get well only if they are included, and die sometimes for want of them.

THE CHRONIC MALARIA OF THE MIDDELVELT AND HIGHVELT.

This is the type of malaria most characteristic of the higher altitudes, manifestations of the disease in the partially immune resulting from often repeated small infections over a number of years, added perhaps to some immunity which was congenital. Invariably infections here are benign tertian and appear to be almost always small, saturation being rare and occurring only, as described elsewhere, in badly malarious years.

Added to this, and probably assisting to produce it, dwellers at the higher altitudes are more robust and less lethargic, putting up more natural resistance to invasions, probably by a quicker tissue response and a livelier leucocyte. They are certainly more energetic in the temperate and invigorating climate of these parts. Tissues cease to respond so acutely to the irritation of the toxin, produced in smaller quantity and regularly, for brooding is seldom checked by treatment as the manifestations are not recognized as due to malaria—indeed, put as shortly as possible, the symptoms of chronic malaria appear to be due to the efforts of certain tissues to eliminate small quantities of toxin repeatedly being produced. The various manifestations of chronic malaria here, in the order of their frequency, are as follows:—

Chronic Bronchial Catarrh.—This is the commonest of them all, the chronic cough and "cold" from which more than two-thirds of those living at the higher altitudes suffer; during the heat of summer these people are subject to acute exacerbations of these colds, when they sometimes ache all over as in an acute malarial attack. These acute colds of summer are very common and I am often asked what could cause them when it is impossible to get chilled

and when the disparity between the day and night temperature is actually in the neighbourhood of 20°—the mean temperature of summer varying between 63° and 72° F. They are really malarial attacks in the partially immune. Many times a patient has come to me aching all over, with a severe headache and "a heavy cold," who has gone away after an intramuscular injection of 3 gr. of soamin, taken 10 gr. of quinine and declared himself quite all right again in four or five hours' time or perhaps next morning.

Throughout the winter months, however, the condition is evidenced by a chronic cough without acute exacerbations but with a marked periodicity, worse at night and therefore often called a "night cough." On visiting any of the scores of schools in the district more than half the children will be coughing incessantly, the well-known strident, useless cough, which has become habit and is easily recognized anywhere. It is invariably worse when lying down in bed at night and characterized at this time by spasms of violent coughing; mothers have told me that they scarcely hear the children coughing by day, but no sooner are their heads upon the pillow than the fits of coughing become so violent that they get quite hot and the pillow wet with their perspiration. The same thing happens to adults as to the children. There is little expectoration and that thin, watery and frothy,—never is it purulent or muco-purulent. On auscultating such a chest fine, moist râles are heard scattered thinly all over the chest but rather more of them over the roots of the lungs. It was the periodicity of the cough which first suggested its treatment by quinine to me, after trials of every description of "cough medicine" which my ingenuity could devise during many months, and I found it quickly relieved after even a few moderate doses; when taken with any regularity the chest may be found to be quite clear of all moist sounds in the course of forty-eight hours. Tabloids of quinine are now often known as "cough pills" amongst poorer communities and used as such.

The catarrh is caused by the presence of toxin in the lungs and the cough induced by its irritation and efforts to get rid of it; it can be smelt in the expectoration by those who know it. Blood smears from these cases have never failed to reveal the presence of benign tertian parasites in the sufferers. The night attacks of coughing are no doubt due to brooding and the liberation of a further dose of toxin.

The Chronic Rheumatism of the Highveld.—For many years this condition has been associated with life at the higher altitudes, to which it is attributed in some indefinite way. I may say at once that smears of cutaneous blood have proved negative time and again, suggestive pigment alone having been reported in this affection, but the result of anti-malarial treatment puts the cause of it beyond question to my mind, for it is quite intractable to ordinary remedies for rheumatism. Cases have been under other treatment for many months without cure; some have been lame for years in spite of everything tried; sufferers may be met all along the coast at various watering places trying lower altitudes without relief and at various hot springs trying to soak the aching misery out of their limbs—it is assuredly a scourge of the South African

highlands—until recognition of the true cause leads to employment of the really appropriate treatment and cure in due course.

Again, a periodicity is noticeable, seasonal, as the rheumatism is often better during the winter months and worse during the summer, when reinfections no doubt occur; diurnal, as the aching is generally described as being worse at night and better by day in addition to which periods of relief often occur for a week or more followed by an increase in severity again and again, coinciding, no doubt, with the brooding of parasites and the liberation of more toxin; for this rheumatism is doubtless due to the irritation of toxin derived from brooding parasites in the marrow and cancellous tissue of the bones. Invariably enlargement of the spleen will be found in these cases, often considerable enlargement, and generally anæmia with weakness of sight and weakness of the heart muscle.

The places of election for this rheumatism are, in order of frequency, the lower third of the tibia, the ends of the long bones above and below the knee-joint, the head of the femur when the hip is affected, the head of the humerus when the shoulder is affected, and the bodies of the larger vertebræ, producing a chronic backache in many middle-aged men and women. From descriptions of the position of the pain one would naturally look for some distension of joints with synovia but they seldom show any departure from the normal.

As regards treatment cases respond in a very short time to injections of organic arsenic, and do well under intravenous injections of larger doses of neo-salvarsan and kharsivan which, to my mind, should never be given intramuscularly even in the smallest dose; but quinine must be taken in conjunction with the injections, and in the largest doses the patient can be persuaded to take 10 gr. thrice daily if possible, to materially shorten the period of treatment to effect a cure. Very chronic cases have been ultimately cured by no larger doses than 5 gr. three or four times a day in conjunction with arsenical injections, but it takes longer. Patients who cannot take quinine because it "interferes with their duties" as they tell you, will generally take 10 gr. each night, in conjunction with intramuscular injections of 3 gr. of soamin or sod. cacodylate every four days, with steady relief of the rheumatism until they miss it, and this is my usual treatment.

Asthma and Croup.—These conditions are very common over the middle- and highvelts, the former amongst adults and the latter amongst the children, and appears to be entirely due to the irritation of toxin in the lungs. Blood smears have repeatedly shown the parasite of benign tertian infections to be present in these cases.

The asthmatics invariably have a certain amount of bronchial catarrh and cough, the asthma occurring only at night, "every night," they usually report. Other evidences of malaria having been discovered, an intramuscular injection of arsenic and 5 gr. of quinine four hourly, or 10 gr. on retiring at night only, has to them an astonishing result, but though complete relief follows, relapses after a few weeks or

months will inevitably occur until some sort of protection against reinfection is undertaken.

With regard to croup in the children, it appears to be due to irritation of the rima glottis by the toxin—indeed I look upon both these affections as due to laryngeal irritation—which is constantly being brought up by the explosive coughs which accompany and precede for a week or so this condition.

Children of a year old will readily take an injection of 1 gr. soamin into the gluteus muscle with speedy relief, whilst a few days on one of the preparations of tasteless quinine will cure the cough. Children take these intramuscular injections of arsenic very satisfactorily, and older children—from 4 to 6—will take a 3 gr. injection of the same drug with immediate improvement.

Emphysema and Dilatation of the Heart may be taken together as cause and effect, and are very common indeed upon the middel- and highvelts in later life. Every other farmer met with—even a larger proportion—carries a big, barrel-shaped chest, prominent in front, giving it a round instead of an oval contour, and to percussion the slightest tap gives a loud drum-like note. Invariably these men have had "bronchitis" (bronchial catarrh and cough) for years, and at 48 or 50 they begin to discover that they have hearts, for they tire and become breathless over the ordinary walks about the farm which but a few years ago they took without thinking about it. Upon examination the apex beat of the heart is at once seen to be at least 2 in. lower than normal—in many cases even more—to be diffused, and the first sound to have lost all abruptness. No bruit or murmur is to be heard as a rule, but just the dilatation of a weakened and periodically anæmic heart muscle giving way before obstruction to the circulation through the lungs. In my experience this condition is the commonest cause of death amongst the men—principally—upon the middel- and highvelts.

It is quite the usual thing for the sufferers from bronchial catarrh, chronic rheumatism and emphysema to deny ever having had malaria, or at least since they were quite young, and indeed it is so many years since they suffered from an explosive attack of malaria, even since the minor symptoms which were evidently still malaria occurred, that they have been quite forgotten along with the other diseases of childhood.

But the memory of all these chronic filariæ is always noticeably short and poor, younger people amongst whom they live being able to tell you of various other cerebral results of this chronic disease, such as irritation and violent temper over trifles, complacency and extraordinary delusions of success regarding their farming operations, which are obvious to their children even, and a ready somnolence when trying to think out some solution of a difficulty, or when trying to read a book; they will tell you that the "old people" (though only in the neighbourhood of 50) have become very petty, childish and irritable. All these cerebral symptoms, which have undoubtedly been relieved in some, and even prevented in others by antimalarial treatment, must be included in the category of the many others caused by chronic malaria.

As regards treatment, I think nothing further than that already described need be added except that I consider the effects of this chronic malaria so serious to bodily health, to mentality, and even to life, of the population of a country like our own as to call for national efforts to encourage effective protection against infection by example and every other means possible; for whilst they must have water near at hand to their dwellings, for household purposes and to irrigate their crops, &c., little can be done in the way of drainage and the removal of water from their vicinity, and furthermore, were this possible, the removal of water from the huge vleis and pans (lakes), lying in deep depressions all over the country, would be well nigh impossible to encompass.

Considering all the serious and trying conditions due to malaria which I have tried to describe without exaggeration, I never cease to be astonished at the contempt felt and expressed generally for the disease, invariably alluded to as "only malaria!"

POSSIBLE PRESENCE OF PARAGONIMIASIS AMONGST INDIANS IN NATAL.

By F. G. CAWSTON, M.D. Cantab.

THE presence of several distinct species of styloletered cercariæ in South Africa suggests that the one which is responsible for paragonimiasis, or lung-fluke disease, in the Far East may also occur in South Africa. Although this condition has not been recognized amongst South Africans, there are a large number of Indians suffering from chronic coughs at the Natal Coast, and in all my travels I do not remember to have seen such a vast number of fresh-water snails as that which exists in the water-cress beds of Durban. Nothing is done to prevent the breeding of these pests which constitute a real danger to the health of the community in Durban as well as to those Indians who are continually wading amongst the water-cress and gathering it into bunches for human consumption.

Styloletered cercariæ have been isolated from three distinct species of fresh-water snails obtained in these water-cress beds; some of them are encysting forms showing them able to resist the effects of drying when collected for the market. The vast majority of the fresh-water snails in this locality are examples of *Melanoides tuberculata*, a very large proportion of which are infested with styloletered cercariæ. This species has been shown to act as one of the intermediary hosts for *Paragonimus westermani*, but the parasite has been isolated from several distinct species of fresh-water snail in the Far East.

There are several difficulties connected with the prophylaxis of lung-fluke infestation in Natal:—

Firstly.—*M. tuberculata* has an operculated shell and is thus able to resist drought for several weeks at a time, and to continue to emit cercariæ when returned to a fresh-water medium on the return of the rains.

Secondly.—This is a large, stout shell. I have collected some examples 34 mm. in length. It is therefore doubtful whether domesticated duck would devour them quite so readily as it would devour the

smaller shells, and the introduction of these birds would not be recommended because they feed upon water-cress. It is probable that, if they did swallow the snails, the animal would attempt to come out of its shell and thus be destroyed along with the cercariae in the digestive juices of the duck. Koboyashi has shown the collection and destruction of snails reduces the infection. It would probably be better to use lime or copper sulphate in order to control the number of fresh-water snails amongst the water-cress that is being used for human consumption; but every care should be taken to cleanse the water-cress of all cercariae or cysts before it is eaten. A good quantity of salt will also assist in destroying these parasites and a careful look-out should be kept for any person harbouring the adult parasites and expectorating the ova into these pools of water. Fortunately it has been shown that emetine readily destroys the adult flukes in the lung capillaries of infected persons, whilst antimony is still on trial, so far as paragonimiasis is concerned.

Like *C. caustoni*, all the styletated cercariae from these pools possess a pharynx. Whilst *C. caustoni* possesses four mucin glands, *C. puerilis* possesses three, *C. cephaladeni* five, *C. humilis* about thirteen and *C. ingravilis* numerous mucin glands. These last two cercariae also possess pro-pharynx. *C. ingravilis* occurs in *Isidora*, *C. humilis* in both *Limnæa natalensis* and *Physopsis africana*. The adaptability of trematode worms to new hosts suggests that either of these cercariae may occasionally occur in *M. tuberculata*. The presence of numerous mucin glands suggests an affinity to paragonimiasis. The water-cress beds swarm with small crabs. So far I have not had the opportunity of examining the crabs for cysts, and the possible presence of the tubercle bacillus in the blood-stained sputa of several Indians from this locality has rendered the examination of many cases for the possible presence of ova somewhat risky.

A second intermediary host is not always necessary for the completion of the life cycle of *P. westermanni*, and the adults have been grown from those cercariae which have encysted on their escape from Melania; but the water-cress beds at Durban contain numerous crabs and it is possible that *Potamonautus perlatus* (Milne Edwards) or *P. depressus* (Krauss), which are both common at the Natal Coast, may act in this way.

A Case of Balantidian Dysentery (Melnotte, Arch. Instituts Pasteur de l'Afrique du Nord, vol. ii, 1922).—This form of dysentery is very rare in North Africa. The patient was not severely ill, but was passing diarrhetic stools with blood and mucus, alkaline in reaction and numbering 6-8 per diam. Besides the balantidia, ova of ascaris were numerous; the organisms were typical and contained ingested red blood corpuscles. As treatment thymol and salicylic acid, 1 per cent. lavage, was used, followed by santonin and calomel as a vermifuge. The author is of the opinion that the symptoms were due to the balantidia and not to the co-existent helminthic infection.

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HOT WEATHER AND SOME OF ITS EFFECTS.

Four deaths from hyperpyrexia within three months in Hong-Kong. Alcoholic heat stroke: Cause, fusel oil poisoning.

NOWHERE is the weather more a subject of discussion than in the British Isles, and Britons in their own country are worse offenders in this respect than

visitors from abroad. The Frenchman sums up a British summer as a succession of three fine days and then a thunderstorm, and the variations of dress required is pithily declared by the versatile Frenchman when he states that he never knows on proposing a visit to England whether to provide himself with a white hat or a pair of skates. The Japanese tell their men or women about to sojourn in England that the land is always enveloped in fog, and the sun is never seen, or only as a mere blur. The Australian attacks us as being a degenerate race compared with their progeny, because perfection in man, animal or vegetable can only be met with in such a climate as theirs, where the sun shines as the sun should, and where every living thing can be seen in their perfection. Hence their men, their horses, sheep, &c., are only to be found of the finest specimens of created things. It is suggested to them, however, that a three years' drought is not an uncommon thing, when their flocks of sheep perish in their millions, and the land is well-nigh barren of crops and famine threatens. So it has always been in Australia to such an extent that before Englishmen went there their continent was sought after by neither man nor beast.

The late well-known American philanthropist, Mr. Passmore Edwards, I met at dinner in the house of a well-known doctor in London. He joined a group of doctors assembled round the fire after dining, when he remarked: "For fifty years I have spent my days visiting the various parts of this world, and there is no community or nation I have not made myself acquainted with where I have stayed from weeks to months, and sometimes years. In my old age I have made up my mind to settle in the South-East of England." His audience of London doctors had just been denouncing the British climate, and Mr. Edwards said: "I suppose this will surprise you, but all I can say is, in the spot I have selected it is never too hot to do what I want to do, and it is never too cold to do what I want to do, and you can't say that about any other spot on this earth." We felt rather crushed, and we slunk away feeling ashamed of ourselves. Lately, in July and August this summer, we have been visited by a spell of trying heat. "Trying" is perhaps the term in general use. In so moist an atmosphere as that of the British Isles a rise of temperature to between 85° F. and 100° F. in the shade is occasionally experienced. The word "trying" is the state given to places in the tropics, adjacent to the coast, and because that is the permanent condition extending for from four to eight months in the year in many places, the climate is always spoken of as "a trying climate." Its "bleaching" effects are apparent, the anæmia is universal, and the development of ailments peculiar to the tropics prevail. In Britain these very hot spells are not frequent, but when they do occur they are not relished except perhaps by the scantily clothed younger women of to-day we see parading their clinging transparent garments to the public gaze in the streets. To the more respectably clad members of the community hot weather is condemned in unmeasured terms, work is lessened in its vigour and amount, and

holidays become the rage. The doctors fly from our cities to such an extent that "specialists" are few and far between; so much so, that bitter complaints are heard in every direction, and attendance at the general hospitals reduced to a minimum. These specialists would seem to have chiefly patients of the class that can afford "grouse moors" in Scotland on their visiting list, and their door maids are accustomed to reply to callers that: "Oh, Mr. or Sir So-and-so is not at home; you see, his patients are all out of town."

Really hot spells of weather in the moist close atmosphere of our big towns produce detrimental effects in the form of heart failure, sun and heat stroke and such ailments; these are not confined to the tropics, for in New York, Paris and London, more frequently do we read of deaths from sunstroke than in tropical cities such as Bombay, Calcutta, Cairo, the Central Provinces of India, and in large cities in Brazil, Mexico, the Malay States, Singapore, and the Southern Provinces of China.

Soldiers during manœuvres in a hot July in England often show a larger proportion of men "falling out" on a march than even in the Khyber Pass amongst the men who are inured to several years' residence in India. These coincidences are to be explained away no doubt in several ways; but our hot summers cause more collapses in our crowded streets during processions than anywhere in tropical cities. The men and women of the ambulance corps in Britain are kept busy to an astonishing degree, and are constantly bringing in numbers suffering from collapse to receive "first-aid."

The condition which causes these cases of collapse are: the crowded streets, the heat of the day, the absence of fresh air, the presence of carbonic dioxide—due to dense crowding—very frequently the want of food and the excitement which obtains during the procession. The patient becomes pale, cold, wants to lie down, temperature is slightly below the normal, and until treated by fresh air, tea with plenty of sugar and at times some whisky, takes some time to recover.

Heat Stroke.—The writer has seen in a tropical climate (Hong-Kong), at a period covering some three months of the hot season, no less than four men die of heat stroke suddenly. The details were as follows:—

(1) On May 5, 1888, an English traveller landed in an hotel in Hong-Kong from Japan, and the writer, when he was called to see him, found him at 6 p.m. suffering from heat stroke. He was alcoholic and incoherent in speech. His pulse was 121 and his temperature 108.2° F. Various remedies were tried but anything given by the mouth, drugs, or iced fluids, provoked vomiting. The temperature at 7.30 p.m. was 109.7° F., his pulse 127 and he was unable to move or speak. By 9 p.m. he had stertorous breathing, a temperature 111° F. and he died at 10 p.m. His temperature fifteen minutes after death in the rectum amounted to 113° F.

(2) An American commercial traveller on May 26, 1888, had landed from Japan, in the forenoon. He ate no food but continued to drink brandies and soda

until he got into such a state that the writer was sent for. The patient, a big, stout, burly man of about 40 years of age, was in a state of heat stroke with a temperature about 5 p.m. of 109.7°F . and a pulse of 130. None of the many remedies tried—venesection, hypodermics of antifebrin, wrapping in a sheet dipped in ice-cold water, &c., &c., relieved, or in any way lessened the delirium; and at a temperature of 112.6°F . in the armpit, the patient collapsed and died. Ten minutes after death the temperature in the rectum stood at 112.8°F . Sir Patrick Manson saw this patient with me some twenty minutes before he died.

(3) A case almost identical with the above the writer found in the Hong-Kong Hotel, on June 15, 1888. He also was a commercial traveller who came from the U.S. America, after a sojourn in Japan. On the morning he landed at the hotel he proceeded to drink whiskies and soda plentifully; he was about 35 years years of age and evidently a chronic drunkard. The writer was called to see him at sunset and found him hopelessly alcoholic with a pulse of over 130 and a temperature of 112.7°F . in the armpit. By 8 p.m. Sir Patrick Manson arrived, but in fifteen minutes time the patient collapsed and died.

(4) The fourth case was first seen by Manson at 4.30 p.m., July 11, 1888; and he asked the writer to come to the hotel and bring his thermometer with him as he was certain that his own was out of order. The writer did so and the temperature on both thermometers (Manson's and the writer's) stood at 110.2°F . Everything available was done for the patient but nothing relieved, and in five hours after Manson saw the patient the man died.

(5) A man, aged 60, long resident in Mauritius, and who had malaria shortly after it first appeared in Mauritius in 1866, fell ill with malarial fever in Hong-Kong, and was treated by Dr. Hartigan in March, 1890. The temperature ran up to 110°F . at 12 noon. Dr. Hartigan called in the writer to see the case and when seen three-quarters of an hour afterwards the patient, by careful treatment, was perspiring, but the thermometer still showed 108°F . Chiefly by wrapping the patient in sheets wrung out of iced water and rubbed over with ice continuously, the temperature fell to more normal limits and gradually the patient recovered.

(6) In the August of 1887 the writer had to treat a man whose temperature rose rapidly to 108.2°F , as he was being watched in bed. Antifebrin had just reached Hong-Kong, in fact a day previously. Anxious to try the new drug the writer injected a few grains—perhaps 6 gr.—hypodermically; as no weighing scales were available, and as it was first sent out in powder in bulk there was no means of gauging the exact quantity injected. However the case was desperate, the temperature rising rapidly as one sat by and watched it and something had to be done. The effect was almost instantaneous and one was favourably impressed with the new antipyretic and the rapid good the administration by the subcutaneous method did. Neither aspirin nor phenacetin had yet reached Hong-Kong.

The cause of what seemed to be a small "epidemic"

of "heat stroke" in 1888 seems to require some explanation. For many years one has pondered again and yet again over those fatalities. Was the "outbreak" due to coming from Japan to the tropics—well nigh 1,000 miles of sea—straight from north to south? The men who were rendered "feverish" and delirious had perhaps malaria previously; this was not true of three of the first four mentioned, for none of them had ever been in the tropics before. Their journey was in one case from Britain, and in the others from the U.S.A., to Japan. In no case until Japan was reached had any of the travellers been exposed to malaria, and in Japan malaria is not as a rule rife at any time, and in large cities where travellers mostly abound the disease is not common. What could otherwise have brought about these calamities? Alcohol? But death in a few hours from whisky or brandy drinking is very uncommon, if not unheard of, in four of five instances within a short period of each other. Where was the spirituous liquor obtained—Japan? For before the men reached the hotel—they were quite drunk before leaving the boat in Hong-Kong to go to the hotel! In 1888 what kind of alcohol was sold by the Japanese to passengers leaving Japan to go south? The fact is they had only just started to make whisky or brandy themselves locally in Japan. The raw spirit was not bonded as it has been later; it could be sold the moment it was made, when fusel oil was being supplied in the raw state, a deadly material given in the middle of last century in the North of Scotland with untoward effects. The instances recorded of the Hong-Kong fatalities in 1888 were undoubtedly due to acute alcoholic poisoning and not due to simple heat stroke alone.

The statement that the writer took the temperature in the rectum after the death of these patients in the year 1888 is perhaps well nigh impossible to credit; but long before then a nurse in Charing Cross Hospital had initiated the practice of keeping for *her own information* post-mortem records of patients' temperatures; it was told me especially after death from rheumatic fever. The fact of the temperature after death rising in the rectum was first officially recorded some ten years after Nurse Mugford did so. It was announced in Germany at the University of Munich by the Professor of Clinic Medicine there. This nurse at Charing Cross Hospital had many records on many subjects. She was the most acute clinical observer the writer ever met and the first to elucidate the fact that in many ailments the temperature rose up to 10 to 20 minutes after death. Time prevents this subject being further pursued at the moment.

JAMES CANTLIE.

Annotations

Spirillary Bronchitis in Katanga (R. Mouchet and J. Van Nitsen, *Ann. Soc. Belge de Med. Trop.*, vol. ii, 1922).—Cases of bronchitis associated with blood-stained expectorations appear to be common in Katanga. Spirochaetes were found in the sputum associated with numerous bacteria including pneumococci, staphylococci, streptococci and several other species. The malady often leads to bronchopneumonia and pneumonia among the natives. As treatment tartar emetic, stibanyl, ioglysol (a colloidal preparation of iodine and glycogen) and neosalvarsan have been used. As long as expectoration lasts spirochaetes continue to appear, and the first three drugs have no action whatever on them, although they appear to influence the condition favourably.

Emetine Injections (G. F. Cawston, *Brit. Med. Journ.*, October 7, 1922).—The author suggests dissolving the emetine tablet in 1 per cent. carbolic immediately before injection, to avoid the pain commonly resulting from emetine injections. The weak carbolic does not alter the character of the drug, and is also gratifying to the patient. Reliable preparations of the drug should be used and intramuscular injections are preferred.

Yatren in Amebic Dysentery (S. Mello, *Brazil Medico*, July 22, 1922).—Clinical histories are given of six cases treated by Yatren, an iodine derivative of benzol-pyridine, containing 30 per cent. of iodine. In all the cases had proved entirely refractory to emetine and other treatment, but responded to Yatren administered in enemata or by the mouth, and were rapidly and completely cured. The dosage per os as 1 grm. three times daily; as enema, 10 grm. in 100 c.c. of water.

Balantidian Dysentery in Chimpanzees (E. Christaller, *Virchow's Arch. f. path. Anat. u. Physiologic*, cl. ccxxviii, 1922).—In the stools of a chimpanzee at the Berlin Zoo, numbers of active balantidia were seen, but no dysentery bacilli were grown; death followed after a brief illness. At autopsy the intestinal mucosa was injected, swollen and bekked with small chymoses, especially on the mucous folds, but the balantidia could not be seen either in the gut wall or its contents, for which the partial decomposition of the tissues is held responsible. Shortly afterwards another animal died with the same symptoms. In this case the tissues were perfectly preserved owing to a preliminary formalin injection made of the cadaver.

A Study of Thirty-four Cases of Abscess of the Lung (J. J. Singer, M.D., and Evarts A. Graham,

M.D., the *Journal of the American Medical Association*, vol. lxxxi, No. 3, July 21, 1923).—The author comes to the following conclusion: Abscess of the lungs is being recognized more to-day than heretofore. The large number of tonsillectomies done is one factor which is responsible for what is apparently a greater number of abscesses than formerly. Early recognition and operation before the abscess has become chronic frequently prevents the failure of treatment, although many patients will recover with non-surgical treatment. Careful history, taking, physical signs, use of the Roentgen ray and diagnostic pneumothorax make early recognition possible. Patients who do not recover in two or three months need surgical treatment.

Acrodermatitis Chronica Atrophicans and its Relation to Scleroderma (F. Wise, *New York Medical Journal and Medical Record*, July 18, 1923).—The author comes to the following conclusion: Acrodermatitis chronica atrophicans, a variety of dermatitis chronica atrophicans diffusa progressiva, is a distinct clinical entity.

In a certain proportion of cases, sclerotic tissue appears about the ankles, lower legs, knees and forearms; this sclerotic tissue superficially resembles true scleroderma at times, but in reality it has not the character of true scleroderma, in any but the very last stage of development.

A small proportion of patients who present sclerotic patches, not only on the extremities, has already undergone various degrees or grades of atrophy; their histopathological structure is practically the same as that of the scleroses of the limbs. The histopathological structure of sclerotic skin both from the extremities and the trunk, in patients with acrodermatitis chronica atrophicans, does not correspond to the structure of scleroderma in any of its clinical manifestations, with the possible exception of the terminal stage of complete atrophy with its complete absence of elastic fibres.

The sclerosis is always a secondary phenomenon. It is conceivable that a patient with acrodermatitis atrophicans may also have scleroderma. If the areas clinically simulating scleroderma are imbedded (and hence surrounded) by atrophic skin, it is to be assumed that the sclerosis sprang from atrophic territory, hence cannot be true morphea-like, well defined patches entirely surrounded by normal skin; it may be assumed that they are manifestations of true scleroderma.

The doughy, boggy swellings and infiltrations which sometimes precede the atrophying changes in dermatitis atrophicans, do not resemble the oedematous stage of scleroderma enough to cause confusion in diagnosis. The terminal para-articular nodule formation about the knees and elbows have nothing in common with scleroderma.

Scleroderma becomes atrophic—and especially anetodermic in only a very small proportion of cases; according to Lewin and Heller, thirty-one out of 508 cases. Whether it finally becomes atrophic or not, scleroderma bears no relationship to

acrodermatitis atrophicans since the first is a sclerosing process and the second an atrophying dermatitis.

In conclusion I wish to acknowledge my indebtedness to Professor Fordyce for his permission to use the clinical and histological material from his clinic; to Dr. Satenstein for his aid in the interpretation of the sections; and to Dr. H. J. Parkhurst for his aid in collecting the literature.

On Trombicula Deliensis, probably carrier of the Pseudotypus, and on other Trombicula species of Deli. (Bt. F. Welch, the *Kitasato Archives of Experimental Medicine*, vol. v. No. 3).—In Deli there have been found up to the present seven species of Trombiculæ; six of them are new, the seventh is probably a variety of the Formosan *T. pseudoakamushi* (non Tanaka) Hatori. Three of them attack man. I take one species, the *T. deliensis* n. sp., to be most probably the carrier of the pseudotypus, a variety of Japanese river fever; my reasons being as follows: (1) It belongs morphologically to Nagay's Tsutsugamushi group and within this group it resembles closely the *T. akamushi* (Brumpt).

(2) There are some suspicions founded on the geographical distribution.

(3) It is the only human species that we captured also on rats, which rodents play such a large part in the epidemiology in Japan, &c.

(4) Out of approximately 400 *T. schuffneri* (the other possible carrier) captured on human beings, none have caused sickness.

On rats we have detected besides the *T. deliensis*, three other species of Trombiculæ.

Of our Delian species there are three that bear club-shaped sensorial hairs; of all of them we have cultivated the nymphæ, in this way proving them to belong to the genus Trombicula.

The chief properties of the larvae mentioned in this paper are summarized in Tables 1 and 2.

Malaria in Australia (P. A. Maplestone, *Annals of Tropical Medicine and Parasitology*, vol. xvii. No. 2, July 1923).—As far as can be gathered from the incomplete and unreliable records available, malaria is only mildly endemic in Australia north of 19° south latitude. *A. annulipes* and *A. bancrofti*, the only two possible malaria carriers in Australia under present conditions, are much more widely distributed than is malaria.

In various localities north of 19° south latitude small epidemics of malaria occur from time to time; these outbreaks are of short duration, their origin is generally traceable to the introduction of malaria carriers from abroad, the disease does not spread to adjoining camps and towns, and soon dies out, without any very active anti-malarial measures being instituted.

The scarcity of population and Anopheline mosquitoes is not a satisfactory explanation of the absence of malaria from the greater part of Australia.

It is of the first importance to discover the mosquito carriers of malaria in Australia, and when this has

been done, work along the lines of Gill in India and England would possibly yield interesting and valuable results.

A Study of Macrophages in the Human Blood with Special Reference to their Presence in two Cases of Subacute Bacterial Endocarditis (J. J. Sampson and W. J. Kerr, *Archives of Internal Medicine*, vol. xxxi. No. 6, June 1923).—In two cases of subacute bacterial endocarditis, cells foreign to the normal blood-stream were observed. They varied in size from 10 to 80 microns. The nucleus was round, oval, indented or multiple. These cells were markedly phagocytic with vacuoles containing engulfed cells, possibly bacteria, and unidentified material in all stages of disintegration. With Giemsa stain marked fine azurophilic granulation of the cytoplasm was observed. By supravital staining from six to seventy or more granules were noted in the segregation apparatus.

Intermediate forms varying from the cells just described to normal transitional cells (monocytes) were observed.

Their fluctuations were rapid but without periodicity and varied from 0 to 48 per cent. They varied directly with the number of platelets, inversely with the bleeding time and decreased at the time of death. There was an increase from three to fifteen hours after transfusion. The fluctuations were evidently not associated with changes of temperature, pulse, respiration, digestion or sudden changes of physical or mental status.

Certain deductions are made as to origin, cause of production and release, mode of removal and function of these cells through parallelisms of their behaviour with similar cells produced experimentally.

It is hoped that certain criteria, such as segregation apparatus and azurophilic granulations, will be used on a large number of cases of mononucleotoses to aid in the recognition and classification of the group of cells herein discussed.

The Intestinal Lesion in Anaphylaxis (W. H. Manwaring, M.D., A. C. Beattie, A.B., and R. W. McBride, *Journal of the American Medical Association*, vol. lxxx. No. 10, May 19, 1923).—The author comes to the following conclusions: (1) The characteristic intestinal lesion in canine anaphylaxis is stasis and marked oedema of the intestinal mucosa followed by epithelial desquamation, hæmorrhage and superficial necrosis during the later stages of the shock.

(2) This lesion is due to a prolonged contraction of the intestinal musculature, increasing the intraintestinal pressure sufficient completely to stop the circulation in the mucosa during the period of low arterial blood-pressure.

On the Treatment and Combating of Leprosy (B. I. van Driel, *Geneesk. Tijdschr. v. Nederl. Indie*, 192 vol. lxi).—The author has found "Collobiase Chaulmogra" to be useless in the treatment of leprosy even when administered in doses larger than p

scribed by the manufacturers (Dausse, Paris; manufactured by Laboratoires Clin.). He considers the various preparations recommended for treatment of leprosy none too favourably, and has used the crude chaulmoogra oil (15 parts mixed with 85 parts of coconut oil) in daily doses up to 10 c.c., in the leper colony, Lao Simoma, of which he is in charge. This is much cheaper than the other preparations.

The Diagnosis of Appendicitis (L. Drosin, M.D., *New York Medical Journal*, vol. cxvii, No. 11, June 6, 1923).—Although appendicitis is of the most frequent occurrence and has many symptomatic signs, it is often difficult and sometimes impossible to diagnose it. The most important and most constant of these signs is tenderness and localized pain. In recurrent appendicitis it is difficult to elicit the pain when the examination is made with the patient lying in the usual posture and when unimanual pressure is the method employed in palpation.

There are four different postures in which it is possible to bring out the location of pain combined with a special method of eliciting the pain.

In the first method sudden backward thrust is given from the examining fingers to the right of a line between the umbilicus and the ensiform cartilage. The pain elicited will be mild even if the case is acute. Usually no pain is felt, but a shock described as a twist or other mechanical effect. This is especially symptomatic of adhesions.

The second position is the Sims with the patient lying on his side. This posture brings the cæcum and appendix upward and forward into the palpating hand, the tips and palmar surfaces of which are employed or pressure.

In the third position the patient lies on the back with the right leg supported under the knee (left extended) which also brings the cæcum and appendix upward and forward and tenderness or rigidity may be made out if present.

In the fourth method, during a relaxed state of the abdominal walls, between expiration and inspiration, bimanual pressure over both sides of the abdomen will give diagnostic information.

The usual posture in examination by the usual method for diagnostic signs in appendicitis do not always elicit pain.

New combinations of posture and pressure methods successfully elicit pain where any trace of inflammation or adhesion remains.

The Therapeutic Value of the Arsenio-Benzol Drugs (Harold Rischbieth, *the Medical Journal of Australia*, October 21, 1922).—The author gives six years record of arsenio-benzol derivatives: (1) Galyl, 270 tubes; (2) disodo luargol, 1,470; (3) neokharsivan, 1,350; (4) arsenio-benzol, 1,679; (5) nov-arsenio-benzol (billion), 3,856 tubes. Total, 8,625 tubes, nearly all given intravenously. The first three drugs have been now abandoned because the effects were not sufficiently permanent. Arsenio-benzol is regarded as

more potent but more toxic than nov-arsenio-benzol (billion). The latter as now supplied in Australia has less therapeutic value than formerly.

Particulars are given of a few instances of toxicity. Alcoholics are bad subjects; impurities in distilled water employed is considered an important point, and should be re-distilled within two hours of use.

Aranhas Peconhentas do Brasil (Poisonous Spiders of Brazil) (Mello Leitao, *Chacaras e Quintaes*, S. Paulo, xxvi, No. 2, August 15, 1922).—In this paper a brief account is given of the various poisonous spiders found in Brazil, where deaths have been known to occur occasionally due to them

Solid Edema of the Face and Eyelids (Walter Baer Weidler, *New York State Journal of Medicine*, November, 1922).—Four cases of solid edema are here reported which in the author's opinion may be of erysipelatous origin or due to infection of the sinuses or of the teeth and mouth. It is most frequently seen between the ages of 10 to 16. Three other cases are reported as cured by autogenous vaccines with no recurrence. In one of these cases a culture from the nose showed *Staphylococcus albus* and short chain non-hæmolytic streptococcus. Another case showed pure *S. pyogenes aureus*, and the fourth revealed *S. aureus* and a diplobacillus.

Prevention of Venereal Disease (H. Wansey Bayly, *New York Medical Journal*, November 1, 1922).—The value of immediate self-disinfection is shown by statistics notably of troops quartered in Delhi, Egypt and Portsmouth, and the main principles of the Society for the Prevention of Venereal Disease are given, in which it is stated that every effort should be made to render self-protection devices as accessible to the public as possible.

Modern Opinions on the Origin of Melanin (Antonio Stefani, *Pathologica*, November 15, 1922).—Virchow's view that melanin was produced from hæmoglobin, and the contrary view that it was produced from protoplasm, have been considered with reference to the results of chemical analysis. Although the presence of iron has been regarded by some as proving hematic origin, this argument was discredited by the sulphur, undoubtedly present in melanin but not in blood, and the iron found has been attributed to hæmoglobin accidentally included.

Modern views are to the effect that the production of melanin is a physiological process, beginning with the action of autolytic ferments upon proteins to produce colourless cromogenic groups which are then acted upon by oxydases to produce melanin. Bertrand (1893) discovered in some plants a ferment tyrosiniasis, which caused the oxidation of tyrosin and produced pigments. Block concluded that dioxy-phenylalanine, or a substance of the same class, was the mother substance of melanin. Angeli has recently

observed the production of black substances by the oxidation and condensation of pyrrole. Cytological studies have not determined whether or not the nucleus takes part in the formation of melanin.

It is known that the urine of persons with melanotic tumours gradually darkens and becomes black by the absorption of oxygen.

Investigations on the Control of Hookworm Diseases: XIX. Observations on the Completion of the Second Ecdysis of Necator americanus (Donald L. Augustine, reprinted from the *American Journal of Hygiene*, Vol. iii, No. 3). The author comes to the following conclusions:—

(1) The second ecdysis of *Necator americanus*, although a mechanical process, is found to be distinctly unlike the first moult. The first ecdysis is due to the increased size of the larva which bursts the skin while after the larva reaches maturity it shrinks and the old skin is retained, unless broken during the lateral flexures of the larva or by the mechanical aid from foreign substances.

(2) The manner of unsheathing is largely dependent upon the character of the environment. In sand the anterior end of the sheath is worn down by friction against rough surfaces, while in clay loams the sheath is retained by fine masses of soil, vegetation, &c., and becomes broken by the larva moving onwards.

(3) The rate of unsheathing in a given number of larvæ was found to be directly related to the texture of the soil.

(4) Unsheathed larvæ were found to be less resistant to unfavourable conditions than sheathed larvæ.

(5) In an infection experiment it was proven that unsheathed larvæ are infective and become adults in the intestine within six weeks after the larvæ penetrated the skin.

(6) No difference was evident from data obtained from daily egg output calculations, in the infectivity of sheathed and unsheathed larvæ.

Abstracts and Reprints.

THE STANDARD TREATMENT FOR MALARIA.¹

By C. C. BASS, M.D., New Orleans.

THE standard treatment for malaria recommended by the National Malaria Committee is: "For the acute attack 10 gr. of quinine sulphate by mouth three times a day for a period of at least three or four days, to be followed by 10 gr. every night before retiring for a period of eight weeks. For infected persons not having acute symptoms at the time only the eight weeks treatment is required." It will be noted that there are two parts of the treatment—the first to relieve the clinical symptoms and the second to cure the infection. In the present paper the

effectiveness of the first part of the treatment for the purpose of relieving the clinical symptoms will be discussed.

Fever or chills and fever are the most constant clinical symptoms of malaria. They are definite symptoms. Fever is measurable and susceptible to statement in definite terms of temperature. Although other symptoms may also be present, they are not recognizable or demonstrable in all cases. It often occurs that a person may have any recognizable symptoms due to the infection. However, if his resistance gets low enough for all the parasites to multiply sufficiently to produce any clinical symptoms, and an active case of malaria develops, he is certain to have fever, if not chills and fever. These being the most prominent and constant clinical symptoms, they serve as a reliable guide as to the effect of treatment. Any treatment that relieves them relieves any other symptoms of active malaria that may be present.

There is a general impression and belief that although quinine relieves these symptoms in most cases, there are some in which fever or chills and fever persist for days and sometimes for weeks in spite of full quinine treatment. Such opinions are unfortunately expressed or supported by many of the prominent authorities on malaria.

It often happens that in supposed cases of malaria unnecessarily large amounts of quinine are given in one form or another over considerable periods of time in an effort to break the fever, much to the detriment of the patient. In such cases the diagnosis was usually incorrect, and the patient either did not have malaria at all or, if malaria was present, there was some other co-existing disease or condition responsible for continuation of the symptoms. Malaria played no part in their production.

During the past six years fortunate circumstances have brought me in contact, direct or indirect, with the treatment of a great many people for malaria. The effectiveness of the standard treatment in relieving the clinical symptoms has been kept constantly in mind, and special search has been made for cases in which it failed. Many cases in which this has been reported have been investigated. Up to the present time not a single case has been found in which fever or chills and fever due to malaria have continued for four days when the patient was taking as much as 30 gr. of quinine daily.

During the past year a further effort has been made to find these so-called resistant cases of malaria by keeping in touch with the cases of malaria in the large hospitals of New Orleans through the kind assistance of interested medical students. The date on which the patient began taking quinine and the amount taken were recorded. Any case in which the patient was given as much as 30 gr. of quinine daily and in which the temperature rose above normal on or after the third day was reported to me for personal investigation. Thus far four cases have required investigation.

In one of these tertian parasites had been four and confirmed by me just three days previously 30 gr. quinine sulphate had been given daily for four

¹ Abstracted from the *New York Medical Journal and Medical Record*, June 20, 1923.

days and the patient now had a temperature of 104° F. Investigation revealed some delirium, rose spots on the abdomen, gurgling in the right iliac fossa, tympanitis, positive Widal, and typhoid bacilli grew in the blood culture. This was the cause of the fever.

In two other cases it was found upon investigation that the nurse had recorded the quinine as being given, depending on the orderly to give it. One patient had actually received one dose of 10 gr. and the other two at the time of investigation of the supposed failure of the treatment. They were given 30 gr. of quinine daily and the temperature did not rise above normal in either of these cases during which they actually received the quinine.

The fourth case was one in which the diagnosis was made by the laboratory man on one doubtful parasite found on one of the many blood examinations made. The patient continued to have irregular chills and fever for several weeks, although she was given as much as 50 or 60 gr. of quinine daily for several days at a time. The chills and fever finally stopped without a diagnosis being made. It was not malaria.

During the period of six years, when the question of the effectiveness of the standard treatment has been kept constantly in mind and resistant cases have been sought, I have been unable to find a single case in which clinical symptoms were not entirely controlled within a period of four days by as much as 30 gr. of quinine daily. So far as I have been able to ascertain, no such case has occurred in the large hospitals of New Orleans during the past year, during which time they have especially been sought here.

Although I am not prepared to say that such exceptional cases do not occur, they are at least so rare that I have not been able to find even one case.

Therefore, so far as my own experience and observations go, the standard treatment is 100 per cent. effective in controlling the clinical symptoms of malaria.

POSSIBILITIES IN THE TRANSMISSION OF *ONCHOCERCA GIBSONI*.¹

By R. W. CILENTO, M.D.

THE recorded observations on the transmission possibilities of *Onchocerca gibsoni* have so far failed to yield any definite result, and it is thought that the facts here presented may to some slight degree help elucidate this obscure problem.

It is recognized that there is a wide margin of error, and it is not claimed that the observations now reported are in themselves scientifically accurate, but they are of notable significance.

In the first place at a sale of cattle at Kingaroy on November 23, 1917, Mr. Rheuben, meat inspector, to whom I am indebted for the observations, examined about twenty head of cattle awaiting sale. During this operation he noted a large tabanid fly alight on a

cow and attach itself to it for some five minutes. As the tabanid group had from time to time been under suspicion as a possible carrier of the disease, the cow was bailed up and examined. Mr. Rheuben, who is an expert in the manipulation of live animals, could detect no nodules in the neighbourhood of the bite. The cow happened to be sold to a New South Wales cattle dealer, and in consequence it was necessary to quarantine it for some months before admission to the State. When a month had elapsed, the cow was due for dipping, and the area bitten, which had previously been marked, was closely examined. A distinct nodule about the size of a grain of rice was palpable.

At a subsequent date Mr. A. E. McGown, then veterinary surgeon to the department of stock at Townsville, allowed a bullock to be set aside for experimental purposes at the Stock Experimental Station. The greatest care was taken to ascertain that there were no nodules present, several competent examiners being agreed that nothing was palpable.

Following the rains a number of tabanid flies were caught, about seventy in all, and in six of these unidentified nematodes were detected in the neighbourhood of the proboscis. The heads of these six flies were taken at once from slides as detected and transferred to serum prepared by Mr. McGown from the blood of the bullock in question.

Further examination was then made for nodules but the closest scrutiny could not determine the presence of even the smallest. A small incision in the shape of the pouch was made, and while depositing the heads of the six flies therein, in drawing a cork from a small glass tube with a pair of forceps, Mr. Rheuben accidentally broke off a piece of the tube, which was not recovered. The pouch was sealed with collodion and healed in a few days. A month later examination showed two nodules about the size of rice grains over the area where the experiment had been made. The bullock was examined at intervals of a fortnight and one nodule came to be as large as a good-size almond. This was subsequently dissected out by Mr. McGown's successor Mr. J. Legg, and it was found that the piece of glass accidentally broken off was firmly embedded in the capsule. Both Mr. Legg and Mr. Rheuben were satisfied that the nodule was an ordinary onchocercal nodule.

The bullock was subsequently sold to a firm of butchers in Townsville, and Mr. Rheuben, in his capacity as meat inspector, had an opportunity of examining the body after slaughter. In all four worm-nests were discovered within 3.8 cm. (1½ in.) of the spot at which the experimental incision had been made. No other nodules were present in the animal.

At a subsequent date (August 2, 1922), while assisting several men to free a bullock bogged in a small creek, Mr. Rheuben noticed a large tabanid biting the animal and marked the spot. Examination having failed to produce evidence of any festation with nodules the bullock was set aside for a month before slaughter. On removal of the hide, to the great interest of Mr. Rheuben, who superintended the operation, there appeared at the site of the bite a coiled worm in a state of commencing encapsula-

¹ Abstracted from *Medical Journal of Australia*.

tion. Careful dissection allowed of the removal of a worm which on being uncoiled was found to be 17·8 cm. (7 in.) in length. Mr. Legg, of the Stock Experimental Station, pronounced it on examination to be definitely *O. gibsoni*. The worm is at present preserved in the museum of the Stock Experimental Station, Townsville.

The species of tabanid flies which were concerned in the second observation were identified by Mr. Gerald Hill as being in the main *Tabanus germanicus* and *T. aprepes*.

From information supplied by Mr. Hill, based on observations made during the period October, 1919, to September, 1920, it appears that the larvae of *T. aprepes* may be generally found in all stages of development during the latter part of the wet season in Townsville (namely, from February to April inclusive), on or near the surface of clear and moderately deep pools amongst submerged herbage near the banks, upon the submerged stems and leaves of aquatic plants of all kinds, and in floating masses of algae.

It is readily conceded that the observations on *O. gibsoni* recorded above there is nothing to prove that actual infestation was directly due to the bite referred to in each case. Similarly, except by slaughter and examination, it could not have been demonstrated that the animal in question was free from infestation at the time of the observation and prior to the biting, though all possible steps were taken to determine such infestation—with negative results.

A series of observations, however, which proceed from the detection of a definite though tiny nodule occurring after a bite to the actual detection of a worm parasite identified as *O. gibsoni* in a stage of partial encapsulation, the approximate relation between the widespread distribution of the tabanid fly and of the diseases in North Queensland, and common opinion which indicates a much greater prevalence in those districts in which tabanids chiefly are bred out, indicate the possibility that the relationship between the bite may not be merely coincidental, but may prove to be one of cause and effect.

Correspondence.

ADMINISTRATION OF QUININE PER RECTUM.

To the Editor of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—I was much interested in reading in your issue of July 2 an article by Dr. Fletcher condemning the administration of quinine by the rectum and recording a number of cases in which very remarkable symptoms ensued as a result of this mode of administration.

I have been in the habit of using this method of administration of the drug in cases of cerebral malaria for a number of years, and have never seen symptoms ensuing in any way comparable to those recorded by Dr. Fletcher.

My technique of administration is to dissolve the dose of bihydrochloride of quinine (I have no experience of any other salt of quinine) in 4 oz. of saline. The mixture is warmed to blood heat, or even two or three degrees higher, and introduced well up the rectum by means of a soft rubber catheter, to which is attached a funnel, the solution being allowed to run in slowly by gravitation. I have personally administered the drug in this way in a number of cases, and supervised its administration in numerous others, and have never seen any untoward symptoms result as a consequence.

Dr. Fletcher asserts that quinine introduced *per rectum* is not absorbed, and is therefore useless. It is within my knowledge that one advocate of this method of administration actually injected a dose of quinine in salt solution into his own rectum. Within ten minutes of administration he had got a violent headache and severe buzzing in the ears, undoubtedly pointing to a rapid absorption of the drug.

During the East African campaign I came across a number of cases of malaria which were treated in hospital with adequate doses of quinine in solution by the mouth, but which, doubtless from some fault in assimilation, possibly as a result of a chronic gastrointestinal catarrh, failed to respond properly to treatment, and still showed a few parasites in the blood with a "low" type of fever. At my suggestion these cases were given intrarectal injections of quinine of 20 gr. nightly for a few nights, and the administration of quinine by the mouth stopped. As a result the parasites and fever at once disappeared.

Further, I have treated one case of benign tertian malaria exclusively by rectal quinine administered in the form of suppositories, as recommended some years ago by a French authority. Tannate of quinine was used and mixed with coco butter. As a result, all parasites and fever disappeared, but rather more slowly than would have occurred had quinine been administered by the mouth. This, I think, was only to be anticipated where such an insoluble salt of quinine as the tannate was employed.

In conclusion, I may say that from my experience quinine can, with perfect safety, be given *per rectum*, and, further, is a most efficient method of administration.

I am, Sir,

Your obedient servant,

H. B. NEWHAM, M.D., M.R.C.P.

Belize, British Honduras,

August 3, 1923.

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Original Communications

PRACTICAL PARASITOLOGY IN SOUTH CHINA.

By ERNEST CARROLL FAUST, M.A., Ph.D.,
Parasitologist, Peking, China.

No serious-minded physician practising in the Orient would attempt to deny that parasitology is an important branch of tropical medicine in China. However, lack of interest, inadequate information and insufficient time have all prevented the development of medical parasitology in this part of the Far East, so that even now we have little knowledge of the practical problems at our door.

In Indo-China and in Szechuan, French investigators have studied the major infections of man and domestic animals. The dysenteries, æstivo-autumnal and tertian malaria, relapsing fever, clonorchiasis and the nemathelminth infections, ascariasis, ankylostomiasis, trichuriasis and strongylosis are known to be clinical entities embracing large groups of people from the Tonkin delta to the Laos and to Malaya. Likewise, the Japanese have made extensive studies in medical protozoology and helminthology in Formosa and the Loochoo Islands. In the Philippines important problems in tropical medicine were initiated shortly after the American occupation, but most of these investigations have been neglected of recent years. In China only one outstanding personality in tropical medicine has been produced. I refer to the late Sir Patrick Manson, whose brilliant and eventful medical career was initiated in Hong-Kong and Amoy, and whose achievements in medicine are too well known to be enumerated.

It would seem, then, that little is known about the parasitic infections of China, for very little careful research has been made of these diseases here. While this is true in a general sense, certain qualifications need to be made. Many of the infestations of China are those common to the adjacent territories, and several others are cosmopolitan diseases. The life-histories of the causative organisms and the clinical and preventive aspects of many parasitological diseases have already been studied, and where they are known to be present need only to be applied to China.

Noso-geographically speaking, China is divided into two areas, one lying to the north of the Hwai River basin and constituting a dry northern region of slight infection, and one embracing the warm, moist areas of Central and South China and constituting a region of heavy infectivity.

From the information which I have been able to gather from personal study and from other sources in various parts of this vast territory of Central and South China during the past few years, I wish to refer to the following parasitic diseases, placing them in major and minor groups as their clinical importance seems to justify.

PROTOZOAL INFECTIONS.

Major.	Minor.
Malaria.	Flagellate and ciliate dysenteries and diarrheas.
Amœbic dysentery.	Relapsing fever (major infection in certain districts in the spring). Bronchospirochaetosis. Yaws. Coccidiosis. Kala-azar (?).

HELMINTH INFECTIONS.

Major.	Minor.
Cestoda.	Diphyllobothriasis (dibothriocephalosis) and sparganosis.
None.	Tæniases. Hymenolepiasis.
Trematoda.	Paragonimiasis.
Clonorchiasis.	Fascioliasis.
Schistosomiasis	Fasciolopsiasis (major infection in Chekiang Provinces). Dicrocoeliasis.
Nematoda.	
Ankylostomiasis.	Strongylosis.
Ascariasis.	Trichostrongylosis.
Trichuriasis.	Oxyuriasis.
Filariasis.	

Those which I have assigned to the major groups are either diseases of overwhelming incidence in the entire area or are infections of serious moment in certain localities. Those which are listed in the minor groups should be recognized and carefully studied by all clinicians working in tropical medicine in the Orient, in order that the distribution and specific treatment of these infections may be a matter of record. Unfortunately many diseases pass unnoticed and unstudied because they are masked by more conspicuous symptoms. Many others are passed by because the observer is unfamiliar with the diagnostic features of the infections. I have been told by practitioners in several areas in China that certain diseases did not exist in their localities, when a careful search revealed relatively heavy infections to be present.

Time does not permit me to elaborate in detail the information at present available on the parasitic infections of South China, but a brief presentation of certain of these data may be of interest.

Dysenteries.—Amœbic dysenteries are common throughout China. They are frequently associated with bacillary dysentery and with flagellate infections. Two species of causative organisms in amœbic dysenteries are known for China, the common *Entamoeba histolytica* (*dysenterix*) and the recently discovered North China form, *Caudamoeba sinensis*. These two species have been observed in separate and in common infections.

Morphologically and biologically they differ considerably, but their clinical manifestations are practically identical, and both respond to emetine treatment. *E. coli*, *Eudolimax nana*, and *Iodameba bütschlii* have been frequently found in faecal examinations in China, and need to be differentiated from the pathogenic amebæ for clinical reasons if for no other. Furthermore, the proved occurrence of amebic and bacillary dysenteries at one time in certain cases deserves serious study.

Although many clinicians deny that flagellate and ciliate protozoa cause dysentery, it seems within the limits of conservatism to state that *Giardia* and *Balantidium* infections are always harmful to the host, while certain strains of *Trichomonas* and other flagellates may be diagnostic of disturbed digestion. The clinician should be prepared to recognize these symptoms and diagnose accordingly.

While the seriousness of malaria is recognized and its treatment well established, little is yet known of the presence of quartan malaria in China, and the problem of the quotidian and tertian varieties of aestival-automal malaria remains unsettled.

Relapsing fever has a heavy incidence in French Indo-China, and is a common spring infection in the Central Yangtze Valley. Its occurrence has not been reported from the Kwangtung area, but it seems altogether probable that it may occur here. The life-history of the Chinese infection has not been studied, and the transmitting agent is not positively known. It seems likely that the body louse is involved, since delousing measures in an infected region in North China reduced the epidemic by 95 per cent.

Broncho-spirochetosis is known to be common in patients with hæmoptysis in Central China, and is frequently found in Siam and Cochin China. It will probably be found in this locality among cases diagnosed as tuberculosis, thus permitting a simple and effective arsenical treatment to be administered. How common is yaws in Hong-Kong, and how frequently is it confused with syphilitic ulcers?

So little information on all these infections is available that few positive statements can be made.

Coccidiosis has recently been found in the Central Yangtze Valley in natives who had not been in contact with cases abroad. Does the disease exist also in South China in unstudied centres? If kala-azar has followed the Mohammedan invasion along the trade routes from Turkestan and Arabia into China, then it should occur in South as well as in North China. As yet no satisfactory proof has been established of its existence south of the Yangtze. Kedani fever has been located in Formosa, in Java and in the Yangtze Valley. The mite which carries the infection is found in the Pearl River delta. Will the infection be found here also?

When one considers the groups of helminth parasites found in Central and South China, an extraordinarily rich and important field of investigation both with respect to the biological and the clinical aspects of the subject is presented. While a few data have been common knowledge for a

number of years, most of the helminth infections are little known and their clinical aspects poorly appreciated.

Among the cestodes or tapeworms, the larval form, *Sparganum mansoni* was first found by Sir Patrick Manson in the thigh musculature of a Chinese at Amoy. Only recently Japanese investigators have shown that it is genetically related to the adult worm, *Diphyllobothrium*. This adult has been known in Shanghai for several years but has been confused with *Dibothriocephalus latus* (*Diphyllobothrium latum*), the broad fish tapeworm of man, common in Central Europe and certain parts of North America, but not yet proved to be present in China. Manson's worm lives in the little water arthropod, as its first larval host, Cyclops, and is then commonly transmitted to the edible frog or the snake. When the infected flesh of these animals, insufficiently cooked, is eaten by man, dog or cat, the mammal becomes infected, and the worm develops to adulthood in the small intestine of the host. Likewise, if man drinks water containing infected Cyclops he incurs the larval infection, which is the stage Manson first observed. This worm is common during its larval stage in frogs and snakes, and as an adult in dogs and cats in the region of Canton. Conditions seem altogether favourable for the occurrence of this form in man in Kwangtung, and careful search will probably reveal cases.

The beef and pork tapeworms are rarely reported from South China. Is this due to lack of observation, or may it be due to lack of infection in the beef and hogs? It seems unlikely that the methods of preparing the meat for consumption would entirely eliminate the infection from man, since infected Mongolian cattle imported into North China cause occasional infection in natives and foreigners in Peking. Finally, is it possible for infection to be carried by the water buffalo as well as the native cow? No information on this point seems at present available, although one case has been reported from Canton, where the water buffalo seems the only possible larval host.

Hydatid cyst infection has been reported only once from man in South China, from a native of Fukien Province. However, it has been found in the hogs in Hong-Kong, and may be an occasional human infection in the Kwangtung area as it is in North China.

The dwarf tapeworm, *Hymenolepis nana*, which is common in North and Central China, has not been reported from South China. That it occurs here seems not unlikely. In view of the serious clinical symptoms commonly associated with the presence of this worm, suspected cases should be carefully observed.

The trematodes or flukes constitute a group of helminths particularly abundant in Central and South China. Clonorchis is a very heavy infection among the population in the Pearl River delta, while the lung fluke is known to occur in reservoir hosts in Canton. Fasciolopsis, the large intestinal fluke of man and of the hog, is certainly of clinical

importance in Kwangtung Province. Man incurs clonorchiasis from eating infected uncooked fish, and the lung fluke from eating infected raw crab meat. The fasciolopsis infection results from eating uncooked water chestnuts and the red water "ling." Furthermore, there is now sufficient evidence from the North River and from Swatow to indicate that the Oriental blood fluke is a serious menace to Kwangtung Province. Just how widespread this infection is in this vicinity is a question needing careful study, but the intermediate mollusc host has been found in the region of Fatshan in the Canton area.

When one comes to a consideration of the round worms, it may safely be stated that all forms which have been found as human infections in Central China and in Tonkin are equally prevalent in Kwangtung Province. Yet the exact conditions which contribute to the propagation of these infestations in South China have never been seriously considered. Why is occidantal hookworm more common in Hong-Kong than in Shanghai? Why does elephantiasis frequently yield no micro-filariae in the blood? Why is the Cochin China worm apparently more pathogenic in Cochin China than in China proper? When these questions have been satisfactorily solved, then there will be others to occupy the thoughtful attention of clinicians and public health men.

Medical entomology in China is yet an untouched field. India and Malaya, the Straits Settlements, Java and Sumatra all have their special medical entomologists who have studied the arthropods responsible for malaria, filariasis, kedani fever and relapsing fever. A few small collections of biting insects from China have been sent to the British Museum and the Smithsonian Institution for identification, but no single person has yet devoted his full time and attention to the entomological side of medical problems in China.

In the instance of malaria and of amebic dysentery man has no known alternate host which may serve as a reservoir of the infection. But in several helminth infections in China, such as *Diphyllobothrium mansonii*, hydatid disease, and all the known fluke infections in the Orient, not only one reservoir host, but in some cases several such hosts exist, conserving the infection and endangering man's health should he even once fail to heed the dictates of preventive medicine established in such diseases.

The parasitologist is the aid to the clinician on the one hand, and to the man in public health on the other. If I have seemed to lay more stress on the prevention side of the problem, that is because such emphasis is well advised. The clinician should be anxious to co-operate in any undertaking where the health of the community is at stake. Without a knowledge of the life-history of human infective organisms and the conditions under which they are maintained and propagated in various communities, both the clinician and the public health man are working blindly and are trying to combat ignorance with ignorance. It is equally necessary, therefore,

on the one hand to study the effect of the parasite on the human body and the means of combating this infection when once established, and on the other to study the customs of the people and the soil conditions in order to establish effective barriers against infections.

COLOMBO DRAINAGE.¹

By R. EUSTACE TICKELL, O.B.E., M.Inst.C.E.

COLOMBO is a municipality of about 300,000 inhabitants, with a habitable area of 5,725 acres, giving an average density of fifty-two per acre. It is bounded on the west by the sea and on the east by swamps at sea-level; and the interior of the city rises to heights of about 100 ft. Such topography presented peculiar difficulties for dealing with the drainage, which were accentuated by tropical rain-falls approaching the rate of 6 in. in an hour.

The drainage scheme was constructed by instalments owing to financial considerations. The first instalment dealt with about a quarter of the area draining towards the harbour, and was commenced in 1902, and formed part of a complete scheme for the whole city.

The scheme consisted of a partially separate system of sewers and rain-water drains in every street, the sewers gravitating to pumping stations at approximately 20 ft. below sea-level, and the rain-water drains running to the nearest outlet available.

The sewers have a capacity of six times the dry weather flow, reckoned at twenty-five gallons per head per day; and this capacity has so far proved ample for dealing with such rainfall as is collected from backyards. The rain-water drains were designed to take run-offs varying from 1 in. to 2 in. of rainfall per hour, according to the proportion of buildings and garden land.

At the pumping stations the sewage is lifted into main sewers, which gravitate to terminal pumping stations and treatment works.

In November, 1911, the boundaries of the municipality were extended westward and southward, and, in addition to this increase, the census of 1911 disclosed a growth of population which outstripped all previous records and affected the calculations based upon previous forecasts.

In the original scheme the whole of the sewage was to be dealt with by one terminal pumping station and treatment works, situated at Madampitiya at the extreme north of the municipality, with an outlet into the river Kelani, about two miles above the mouth.

In order to deal with the new conditions and to provide for the possibility of still further extensions southward, it was decided to recast the scheme and to establish a southern outfall and treatment works at Wellawatte, with an outfall into the Indian Ocean.

¹ Paper read at the Inst. Civil Engineers on Tuesday, February 20, 1923.

The municipality is now divided into ten drainage areas, with a pumping station in each, including the two terminal stations at the northern and southern outfalls.

The main sewers were laid out so as to gather in the sewage by direct gravitation from the greatest possible area, which amounts to 2,768 acres, or nearly half the city. The eight subsidiary pumping stations deal with the outlying drainage areas, totalling 2,957 acres, from which the sewage has to be pumped twice.

The estimate for the whole scheme amounted to twenty-three and a half million rupees, or approximately £1,567,000; but in 1914 a commission appointed by the Ceylon Government (under whose auspices the scheme had been inaugurated and administered) reported the municipality to be in a state of confessed insolvency and unable to meet the interest on the drainage loan. It was therefore necessary to curtail the expenditure; and, owing to the slow progress in house connections, it was decided to postpone indefinitely the construction of further street sewers, and to substitute a programme of arterial drainage in the incomplete districts. Main sewers and pumping stations only were constructed, and a system of public latrines was established, with pail-tipping depots on the sewers for the disposal of nightsoil collected by carts from house to house. The primitive pail system which exists in all Oriental cities will therefore be continued, although to a diminished extent; but the pitting depot, which was a prolific breeding ground for flies and a serious menace to health, is now being finally abolished.

TREATMENT WORKS.

At the time of the inception of the scheme bacterial treatment had been only recently established in Europe, and its application was quite new to the tropics. The system first adopted consisted of septic tanks, sprinkling filters and storm water beds. These were first put into operation on the completion of the harbour drainage area in September, 1910. In 1913 this instalment became overtaxed by the extensions of the sewers; and, owing to the tropical climate, the ebullition of gases in the septic tanks was found to be excessive. Large masses of sludge were brought to the surface, over the outlet weirs, and choked the filters. When the construction of the second instalment was commenced double-story sedimentation tanks were adopted, and they have effected a reduction of about 71 per cent. of the suspended solids. The effluent contains about six parts per 100,000, which is considered quite good enough for discharge into the Kelani River without secondary treatment.

When their success had been established, the original septic tanks were adapted for double-story treatment by the construction of thin longitudinal partitions sloping transversely towards the side walls at about two-thirds of the depth of the tank. These tanks effect a reduction of 70 to 80 per cent. of the suspended solids.

Wet weather tanks, designed on the same prin-

ciples, have been added, which will deal with a dry weather flow of 335,000 gallons a day each of strong sewage, and when the sewage is diluted by storm water they deal with a flow of 2,000,000 gallons a day each. That is to say, the rate of flow may be increased to six times the dry weather flow. They produce an effluent containing only four to six parts of suspended solids per 100,000 during normal flow, and when dealing with six volumes have given an effluent with eight or ten parts of suspended solids per 100,000.

The works up to date have cost eighteen million rupees, or £1,200,000. 61 per cent. of the area of the city is provided with street sewers, 28 per cent. with arterial drainage, and 11 per cent. remains to be dealt with.

One hundred and twenty-eight miles of sewers and rain-water drains have been constructed.

Since the first instalment was brought into general use in 1911 the average death-rate has fallen from 33 to 27 per thousand, a reduction of 18 per cent.; and Colombo is now believed to be the healthiest city in the tropics.

The Use of Digitalis in Hearts with Regular Rhythm (L. Gager, M.D., *New York Medical Journal and Medical Record*, May 2, 1923).—The value of digitalis in hearts with normal sinus rhythm is discussed, with illustrations of its effect in both mild and marked cardiac insufficiency. Compensation is restored with prompt relief of symptoms. The more serious consequences of heart failure may be prevented. Thus, the disappearance of numerous auricular premature contractions under digitalis would suggest the checking of a process that might (there is no basis of proof) go on to auricular fibrillation. Full digitalis effect, it is emphasized, is essential for securing maximum therapeutic benefits, in which respect much of the current use of digitalis falls short of what is easily possible. Practical considerations in digitalis administration are presented.

A Filarial Survey with a Statistical Inquiry into the Relationship between Filariasis and Elephantiasis (J. A. Cruickshank and J. Cunningham, *Indian Journal of Medical Research*, vol. ii, No. 1, July, 1923).—The authors have come to the following conclusions as regards filariasis in Southern India:—

(1) Microfilariae are less commonly found in those with the recognized signs of filarial disease than in those without these signs.

(2) Signs of filarial disease are less frequent among those infected with microfilariae than among those not so infected.

(3) The microfilaria rate in cases of elephantiasis is very much lower than that recorded in Fiji.

(4) Our observations show that the proportions of persons affected with elephantiasis regularly increases with age.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 1, 1923.

THE USES OF EMETINE AND OF PULVIS IPEACUANHÆ SINE EMETINA IN DYSENTERY.

ON more than one occasion the writer has ventured to suggest, that the drug ipecacuanhæ, deprived of its active principle, or, at least, the most potent of its

active principles, namely, emetine, has brought a great change in the limits of its usefulness.

Time was when the whole root of the plant *Cephalis ipecacuanha* was used for the treatment of dysentery. Later, it was found that two dysenteries became known to us by the fact that only one was curable by the powdered root imported from Brazil, and that the other was capable of being successfully treated by purgatives only, of which the most potent was the sulphate of soda. As knowledge increased the presence of an amœba was found in the intestines and for that form of dysentery ipecacuanhæ still continued potent. The great drawback to administering ipecacuanhæ root was the emetic effect the drug caused, not even opium being sufficient to allay this drawback. The question then arises, Has any detriment to the cure of post-dysentery colitis and other intestinal lesions resulted by casting aside the pulv. ipecacuanhæ and using the active principle only? There seems a general belief that post-dysenteric lesions of the bowel, in the forms of "mucous colitis," "chronic colitis," "relapsing colitis," without or accompanied by recurrence of the amœbæ in the stools to an extent unknown in pre-emetine days, that is, when ipecacuanhæ root was given with its normal emetine content. The introduction of new methods of treatment quickly teaches us to forget the near past, and already the emetine treatment of dysentery has supplanted the previous ipecacuanhæ root treatment to a great extent and holds the field to-day. The older practitioners to-day are apt to forget what the post-dysentery conditions amounted to. Colitis was not so common as now. The disappearance of colitis ended then for the most part with the bloody stools, which ipecacuanhæ cured, but since emetine held sway mucous colitis is a common feature in our tropical medical wards. The cause of these phenomena can be ascribed to the absence of the powdered root in treatment and to nothing else that seems feasible or possible. In former days so objectionable was the powdered ipecacuanhæ root that many medical men used the ipecacuanhæ sine emetine when treating dysentery. The result of this was most unsatisfactory as the root without the emetine was not potent. The moment, however, the hypodermic method came into vogue the ipecacuanhæ without the emetine was given up as the blood disappeared in the stools, and the further treatment by ipecacuanhæ left off, and other plans and other drugs, dieting, &c., carrying. There are in Europe just now many invalids from this change of methods, viz., using the emetine only until (or until shortly after) the hæmorrhage ceases, thinking danger is probably over.

The writer has long upheld the idea, from close observation, that the stoppage of pulv. ipecacuanhæ sine emetine is detrimental after the blood and even the mucus has been stopped, and that there are now definite recurrences of diarrhœa or mucous colitis, and to an extent heretofore unknown. So convincing has this belief become that the writer has made it a form of routine to give the emetine hypodermically in the treatment of amœbic dysentery followed by pulv. ipecacuanhæ sine emetine. The object is to get the

good effects of the emetine on the amoeba and thereby the arrest of the hæmorrhage and the bulk of the ipecacuanha powder without the emetine so as to allay the mucous colitis which threatens to continue. That the combination is good and that the method is therapeutic common sense would appear capable of argument. The argument against it is flat denial only, viz., that there is no increase in the post-dysenteric lesions of the treatment of emetine to-day compared with the pre-emetine days of recent years . . . ! !

It is well-known, mostly only to be disagreed with, that the writer does not give milk as the diet in intestinal lesions. In sprue, hill diarrhœa, even the morning looseness due to alcohol, milk the writer has withheld from most of these as a rule. The milk and the meat schools of treatment are gradually approaching a climax. For some twenty-five years the fight has gradually developed. It was in the year 1889 at Hong-Kong that the writer initiated the non-milk treatment of sprue and other cases of intestinal flux. It has been continued systematically, and has been followed by thoughtful men in the United States of America. In the first place by compulsion during an outbreak of sprue in a district where no milk was to be had. During recent years a well-known physician in charge has freely published his results; this treatment will be followed when milk is available, for no milk will again form part of the dietary of a *non-febrile affection in which intestinal flux is present*, be it sprue, hill diarrhœa, or intestinal flux.

The writer has used *sea water*, one or two pints daily at first for two or three days, and then every second day for a week, and later once a week or once a month for two or three months after the blood in the mucus has ceased to present itself at stool. The water should be collected every week far out at sea, say halfway between Dieppe and Folkestone from a steamer on its homeward voyage, the water to be warmed, 100° F., slowly introduced. If no sea water available Martindale's artificial sea water salts are useful as a substitute only.

Summing up the writer's method of treating post-dysenteric colitis proceed as follows:—

(1) Keep patient in bed. Many patients attempt the cure whilst getting about, provided they have been freed of the passage of bloody mucus.

(2) Give no food of any kind after 4 p.m.

(3) At bedtime give 3 dr. of *mistura olei ricini*, or 1½ dr. of plain castor oil.

(4) At 6.30 the following morning give emetine hydrochloride ½ gr. injected hypodermically at any convenient spot with the usual precaution.

(5) At 7 p.m.: Give 20 gr. of freshly made ipecacuanha root without its emetine.

(6) At 9.30 a.m.: Give a cup of China tea.

(7) At 11 a.m.: Give a few teaspoonfuls of the juice of scraped beef strained through muslin.

(8) At 1 p.m.: Repeat the scraped beef with a little pepper and salt added.

(9) At 4 p.m.: Cup of China tea with egg beaten up in it.

(10) At 7 p.m.: Beef or liver soup, a teacupful.

(11) At 10 p.m.: Repeat soup.

Second Day.

(12) Following morning at 7, tumblerful of hot water.

(13) 8 a.m.: Egg beaten up with hot water, or in tea.

(14) 9 a.m.: Hypodermic of ½ gr. emetine; 9.30, pulv. ipecacuanhæ with emetine, 20 gr.

(15) 11 a.m.: One or two bananas baked in their skins for twenty minutes in the oven and served up in their skins and eaten slowly in their skins.

(16) 1 p.m.: 4 oz. finely minced beef (*see below*).

(17) China tea, 4 p.m.

(18) 6.30 p.m.: Minced beef.

(19) 9 p.m.: Tumblerful of hot water.

(20) During the night, if wakeful, juice of scraped beef.

Minced beef.—1 p.m.: Prepare 5 oz. of beef (top of the round, that is without fat or bone) passed three times through a fine mincer, and the pulp of the minced beef put in a saucepan with salt and black pepper and cold water or well-skimmed gravy in the proportion of a dessert-spoonful to each ounce of the pulp. Beat it well together by wooden spoon to a thick cream (adding a little more liquid if the meat is specially dry). The saucepan must now be put on a cool part of the stove or range, the pulp warmed through very gradually and slowly cooked, being briskly stirred and beaten up with the wooden spoon the whole time. Is gradually and gently cooked for about twenty minutes at a temperature of about 115° F. It must never be left to "keep hot," but turned out at once when "done" into a hot bowl and covered until used.

Beef cakes.—Take 4 oz. of beef pulp minced as above and freed from fat and stringy connective tissue, adding salt and black pepper. With two forks form the pulp cake flat and round and some ½ to 1 in. thick and broil them well over a clear but not a fierce fire, turning the griller every minute for about six or seven minutes. Add a piece of butter on each cake; serve on a hot plate. Of all gastrointestinal ailments perhaps sprue is the most difficult to cook for. The writer does not include milk in the diet of sprue. He gave up milk in sprue in 1889, and has never had occasion to use it again, and he has never been without cases of sprue in his practice, and ever since 1889 meat and beef alone has been the basis and for a time the only form of diet until the ailment is first scotched and then cured. It is a long argument, this question.

THE ECONOMIC VALUE OF A DRAINAGE SCHEME.

THE main drainage of the City of Colombo has been recently completed at a cost of 18,000,000 rupees (£1,200,000). The scheme was carried out by instalments, and the first instalment for about a quarter of the city was brought into operation in 1911, so that sufficient time has elapsed to gauge the effect upon the public health of the community.

The population in round figures is about 300,000, and the death-rate has fallen from 33 to 27 per thousand, a reduction of 6 per thousand, over a period of ten years.

It may be reasonably assumed that the rate of sickness has been reduced in approximately similar proportion. Accurate statistics applicable to the tropics are not available, but in England there are records of the large benefit societies, and on the Continent some similar statistics have been kept, dealing with many thousands of persons over a series of years.

The following table gives the number of weeks of sickness and the number of deaths recorded by three of these societies, with an aggregate of 5,174,960 years of life observed.

	Sickness, weeks	Deaths
Manchester Oddfellows ...	7,022,475 ...	39,061
Hearts of Oak ...	1,452,106 ...	7,853
Leipzig Krankenkasse ...	1,545,613 ...	8,668
Total ...	10,020,194 ...	55,582

These figures establish with remarkable consistency a ratio of 180 weeks of sickness to each death, or say an average of 3.5 adult persons constantly sick to each death.

In Colombo the reduction in the death-rate represents a saving of 1,800 lives, and the above ratio represents 324,000 weeks of sickness saved per annum.

A week's sickness in the case of the breadwinner may be valued at the rate of his week's earnings, but in any case it cannot be less than the value of his keep, or say 5 rupees a week in Colombo.

The expenses of a Hindu funeral include carriers, music, bier, burial ground and entertaining, and vary from 75 to over 600 rupees. A Mohammedan funeral may run to higher figures. As a rough approximation, it may be taken that three or four months' earnings of the deceased will be expended upon his funeral, say an average of 100 rupees.

Now 324,000 weeks at 5 rupees equals 1,620,000 rupees, and 1,800 funerals at 100 rupees equals 180,000 rupees, making 1,800,000 rupees per annum saved upon these two items alone, which represents 10 per cent. upon the total outlay for the drainage scheme.

This does not constitute the total savings to the community, for nothing has been reckoned for medicines, medical fees and incidentals, nor has the total outlay for drainage yet come into full operation. On the other hand, the improvement in health is due to other sanitary and medical measures besides the drainage of the city. There is, however, no doubt that the greater part of the improvement is due to the drainage, as reported by the medical officer of health.

The point to which particular attention is invited is that the funds allocated to such schemes are stigmatized as "Unremunerative Expenditure," because the benefits accrues to individuals and does not appear in the revenue accounts. But here is a concrete instance which shows a more profitable investment than any of the securities of the British Government to-day.

Innulations.

Effect of Plant Tissue upon Growth of Pneumococcus and Streptococcus (H. J. Morgan and O. T. Avery, *Journal of Experimental Medicine*, vol. xxxviii, No. 2, August, 1923).—The initiation of active growth in broth culture of pneumococcus, *Streptococcus hæmolyticus* and *S. viridans* is accelerated by the presence of unheated plant tissue.

Cultures of pneumococcus in broth containing unheated plant tissue show a prolongation of the stationary phase of growth.

Death of the individual organisms in pneumococcus broth cultures containing unheated plant tissue does not proceed so rapidly as in cultures without plant tissue.

The zone of hydrogen ion concentration within which growth of pneumococcus in ordinary broth can be initiated is considerably extended, both on the acid and on the alkaline side, by the addition of unheated vegetable tissue to the media.

Infectious Jaundice in the United States (G. Blumer, M.D., *Journal of the American Association*, August 4, 1923).—The author comes to the following conclusions:—

(1) Infectious jaundice has occurred in the United States for more than a hundred years, and has become widely distributed in the last two or three years.

(2) It may occur in small family or institutional outbreaks or as a widespread disease, with local foci scattered through an entire city, country district, or State.

(3) It is mainly a disease of adolescence, attacking the two sexes equally.

(4) The exciting cause is unknown.

(5) Fatalities are lacking in most epidemics; when they occur the victims are usually pregnant women or young children, and the fatal cases resemble acute yellow atrophy of the liver.

(6) Catarrhal jaundice so-called is probably the sporadic type of the disease.

Efficacy of Anti-variolar Vaccination in the Philippines during 1921 and 1922 (Regino G. Padua, *Journal of the American Medical Association*, vol. lxxx, No. 19, May, 1923).—It is the author's opinion that protection of the public is afforded by systematic and successful anti-variolar vaccination. There are no other factors to which the eradication of smallpox in Manila and the rapid reduction of the morbidity and mortality rates in the provinces during these years may be chiefly ascribed.

Failure to get a higher percentage of positive "takes" than 70 has been due, in large measure, to the inability of maintaining the potency of the vaccine virus, now employed, under tropical conditions. But this cannot oblige the Philippine Health Service to lay aside the hope that, with

persistent efforts in vaccinating and revaccinating yearly the susceptible and the non-immunes, the time will come when the public in general will be completely immunized to withstand subsequent epidemics. It is roughly estimated that this may be attained every six or seven years, if the present system is continually kept up. Moreover, the sanitary inspectors (vaccinating parties) are now becoming more trained and experienced in the appreciation of positive "takes" and in the technique of the vaccination process.

In general, the specific morbidity and mortality rates of smallpox among the vaccinated have been the lowest in infected provinces in which the percentages of immunized population have been low, and conversely also. Rare exceptions to this were due to the large number of susceptible children who became subsequently attacked with a more virulent strain that could not be overcome by the vaccination immunity, and those who, because of religious and various other causes, escaped vaccination.

On the whole 61 per cent. of the cases during 1921 occurred among children, a great proportion of which were never vaccinated, or were unsuccessfully vaccinated. The problem, therefore, fundamentally centralized in the compulsory vaccination of children, such as is now being practised, to include infants of even one month old and younger. And it is hoped that with subsequent modification of the vaccine virus to resist deterioration in hot weather, the actual epidemic occurrence of the disease, in certain sections of the islands, will be completely done away with.

Yaws in Brazil (A. Gavião Gonzaga, *Brazil-Medico*, April, 1923).—According to the author, yaws is known to be prevalent in nine States in Brazil. It was first observed in 1909 by Rabello finding *Spirochæta pertenuis* Castellani in the lesions. 15 per cent. of the population in the towns are affected, but the sea coast is practically exempt. Treatment consists of injections of nearsphenamine, or emetine-iodine, or tartar emetic. In the author's opinion yaws is transmitted principally by mosquitoes.

Insulin Treatment of Post-operative (Non-diabetic) Acidosis (W. Thalheimer, *Journal of the American Medical Association*, vol. lxxi, No. 5, August, 1923).—Injections of insulin and glucose solutions in a small series of cases of post-operative vomiting and ketosis have apparently cleared up these conditions rapidly; much more rapidly than has been accomplished with injections of glucose alone.

Insulin therapy must be given and controlled even more carefully in cases of this type than in cases of diabetes.

Observations on the Use of Insulin in Diabetes Mellitus (William H. Olmstead, *Journal of the American Medical Association*, vol. lxxx, No. 26).—

The use of insulin, more than ever before, lays a great responsibility on the physician to train the patient in the knowledge of diabetes. Food and insulin must be most carefully balanced so that the blood sugar will be as near normal as possible. Under these conditions the fullest opportunity is given for a gain in tolerance.

The Dysenteric Infections in Australia (C. H. Shearman, *Medical Journal of Australia*, vol. i, No. 22, June, 1923).—The object of this discussion into the realms of bacillary dysenteric infection is not to preach the gospel of a new disease in Australia, but to focus attention on the fact which has been so ably demonstrated by Patterson, Williams and Beare among the more recent workers, and by Litchfield, Hipsley and Bradley in Sydney, and Forsyth in Melbourne some few years ago, that bacillary dysentery is and has been endemic in Australia for many years. The only conclusion to be drawn from the death statistics for the Commonwealth is that, though present, the disease is not being recognized as a clinical entity.

Clinical Studies of Quinidin (James G. Carr and Walter H. Spoonman, *Journal of the American Medical Association*, vol. lxxi, No. 4, July, 1923).—Of sixty-one cases in the series one resumed normal rhythm before treatment, leaving sixty cases of auricular fibrillation treated with quinidin; seventeen, 28.3 per cent., resumed sinus rhythm. So far as it is known, these results are the poorest that have been reported. Practically all of the patients in this group were old "cardiac patients," many of whom had been treated several times for broken compensation. These results lend some support to the prevalent theory that quinidin is more likely to cause resumption of normal rhythm in those cases in which the fibrillation is of recent onset.

The rheumatic cases, though not more likely to return to sinus rhythm, did show a greater tendency to maintain the restored rhythm, and to be benefited, clinically, by the change.

The most striking feature in the successful use of quinidin is the subjective relief experienced by the patient; many of the patients immediately expressed their pleasure in no longer feeling the annoyance caused by the irregularity. It is believed that this subjective relief offers the most certain indication for the use of quinidin, and that those patients, in particular, who are troubled by the irregularity should be given the benefit of quinidin therapy.

Though this series is small, it is believed that the restoration of the normal rhythm is often of real value to the patient as an aid to the maintenance of compensation. Under proper conditions quinidin offers enough hope of relief to warrant its continued use, though the treatment of auricular fibrillation had better not be undertaken outside a

hospital until the routine of safe treatment is more carefully worked out.

It is not believed that patients with fibrillation of long duration must be denied the possible benefits of quinidin therapy, simply because the condition had existed for a long time.

Malaria in San Francisco (L. H. Briggs, *Journal of the American Medical Association*, vol. lxxxi, No. 6, August, 1923).—One hundred and forty-three cases of proved malaria seen in San Francisco were analysed with especial reference to the type of parasite and the locality in which infection occurred. San Francisco may be considered a fair sampling point for malaria in California, as the sites of origin of these cases correspond closely with the malarial region of the State, as shown by the State Board of Health surveys.

Estivo-autumnal malaria is found more commonly than supposed, the proportion to tertian being 1:2.5. Diagnosis of this type by blood smears should be made oftener, and the sexual forms should not be considered the sole criterion. The absence of pigmented forms in the circulating blood offers a sharp diagnostic point.

Many patients did not develop their illness at the site of infection, but symptoms started after they reached San Francisco. In some this is accounted for by the natural incubation time; but in the majority recrudescences were brought about by the change to a colder climate or by some physical trauma, such as labour or operation.

As in other States, the incidence was greatest in the late summer months, with the maximum in September.

Palpable enlargement of the spleen was found in approximately 80 per cent. of the series, and no essential difference was noted between its occurrence in the tertian and estivo-autumnal infections. Herpes was present in approximately 40 per cent., likewise with no difference in the two infections.

Abstracts and Reprints.

NOTES ON THE VITAMINS.¹

By S. HARRISON, M.B.

THE modern science of nutrition demands an appreciation and understanding of its many aspects. Its structure is complex but the foundations lie in proper selection of foods, so that deficiencies are supplemented by judicious blending. As recently as twelve or fourteen years ago we firmly believed that food in general was composed of the five elements, proteins, fats, carbohydrates, salts and water, and that a suitably balanced diet of them alone in adequate amounts and proportions was all that could

be required for normal growth and development. Much water has flowed beneath the bridge of nutritional knowledge since then and we have come to realize that though proteins, fats, carbohydrates, salts and water are the bricks and timber of body building, other structural components are essential features. The new-found necessities are well named "vitamins" conveying the concept of livingness or vital force. They apparently exercise a controlling influence upon metabolism. Their chemical and physical composition has not yet been determined, but there is little mystery about their action. When a minute amount of fulminate detonates dynamite, the great bulk of the chemical and physical change is due to the explosive, but the unobtrusive part played by the detonator is none the less essential. Catalysts act the part of overseers or gangers on a job. Without unduly wasting their own energy, they direct operations and insure the work being done correctly and speedily. In their absence things become slack and inefficient. Of such, in crude analogy are the vitamins. The way of their study was paved, in 1910, by a Polish chemist named Funk, closely followed by Hopkins, of Cambridge, McCollum and Davis with Osborne and Mendel, of the United States of America as pioneers. Since then the fascination of the vitamins has fired the enthusiasm of countless observers and the amount of clinical study and laborious experimentation devoted to them is colossal. A mass of unquestionable evidence has been collected and the proofs are complete of the existence of at least three distinct types: (1) Fat soluble A or anti-rachitic vitamin. (2) Water soluble B or anti-beriberi vitamin. (3) Water soluble C or anti-scorbutic vitamin. All are indispensable to proper functioning of the animal body, and continued or severe restriction of them will cause disaster. They are of wide distribution in various fresh foods, but are liable to destruction by prolonged heating, drying, or preserving processes. The animal kingdom is incapable of manufacturing them, being produced solely by the synthesis of the vegetable cell. The plant constructs its proteins, carbohydrates and vitamins; animals must get them ready made or die. This is a fact of the utmost practical importance and has a tremendous bearing on the whole question of nutrition. The leaf is the laboratory of the plant where chemical construction and in this respect is superior to the seed in nutritive value. When the animal organism is receiving inadequate vitamin, some phases of the internal metabolism are disturbed, some essential cogs of the body machine are thrown out of gear. Many of the pathological conditions so produced have been known for centuries: for instance, rickets and scurvy.

Vitamin A.—Vitamin A is stored up in the liver and body fat when the animal is getting plenty from its food. Vitamins in human or cows' milk are derived from are dependent upon the food of the lactating female. When vitamin A is deficient in quantity, retardation or abnormalities of growth may result, as the outward and visible sign of profound disturbances within. The effects may range from minor disabilities too vague to diagnose up to clinic-

¹ Abstract from the *Medical Journal of Australia*, February, 1923.

ally recognizable rickets, characterized by (1) head, sweating and restless sleep, (2) loss of muscle tone, (3) polyuria, (4) pallor, (5) alteration of the long bones of the skull. Bony deformities in the long bones and ribs are late manifestations of the disease. A deficiency of vitamin A is not the sole cause of rickets, and it is, therefore, not a pure deficiency disease. Scurvy, on the other hand, ends inevitably in death if not cured in time by a vitamin diet. Another deleterious effect of deficiency of pre-disposition to infection. Rats, mice, and pigeons employed for experiments fell easy victims to infectious diseases particularly of the respiratory tract. This calls to mind the association of tuberculosis and malnutrition and the beneficial effects of cod-liver oil, milk, bone-marrow, and eggs. The onset of xerophthalmia as an accompaniment of arrested growth in the absence of the fat soluble A factor is a further illustration of a varied sphere of influence. May there be some relationship also to malignant disease and the post-war of influenza?

Vitamin B.—Beriberi endemic where the staple diet is polished rice, as the process of polishing tears out the embryo of the grain. White wheatened flour, pure corn flour, and other modern refinements of similar nature contain little or no vitamin B. Degeneration of nerves, with loss of tone and power, result from prolonged restriction of this factor.

Vitamin C.—For many generations the curative value of fresh fruits, green leaves and certain roots has been known. Dry seeds, such as wheat, maize, barley, &c., are inactive, but on germination the vitamin is produced or liberated from some inert precursor. The members of various Arctic and Antarctic expeditions have suffered from scurvy. Sir John Franklin's, using a good lemon juice, found complete protection, while others, better equipped generally, suffered severely through depending on lime juice, which is vastly inferior to the lemon and orange. Scurvy was rampant in Vienna in 1919 owing to the shortage of fruit and greenleafy vegetable and the use of dried milk in infant feeding. The cases showed the usual features: (1) Anæmia and loss of power, (2) gingivitis, (3) pain on moving the limbs. Early recognition and free administration of orange juice cured the majority of the patients.

The moral attached to a study of vitamins in general, as applied to everyday life, is: the further from Nature the greater the danger. We frequently console ourselves with the assumption that vitamin deficiency diseases are unlikely to occur in Australia as the conditions of life are so favourable. It must be remembered that the full-blown pronounced type of rickets, beriberi, or scurvy is not the only form. Signs and symptoms may be so slight as to escape notice. This borderline of disease represents the condition of thousands of our children, and is a menace we must realize and actively combat. Like the fabled sea-god Proteus, who had the power of changing himself into an endless variety of forms and disguises, so faulty nutrition can manifest itself in infinite ways. Weight disturbance, neurotic unstable temperament, lowered vitality and resistance to disease, disorders of dentition, the eye and respiratory tract, and many more can be directly

attributed to nutritional defects. Small deviations from the optimum composition of food may produce vast changes in the living cells and tissues. It has been proved over and over again that diets derived from miscellaneous sources such as cereals, fruits, leafy vegetables, meat in moderation, supplemented with liberal amounts of clean fresh milk from well-pastured cows, suffice to maintain satisfactory growth and health. These are facts of importance in contemplating the dietary of the expectant and nursing mother, as well as the growing child, the adolescent and the adult.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

VOL. LVIII, No. 5, May, 1923.

The Beriberi and Epidemic Dropsy Problem (J. W. D. Megaw).—In the second part of this paper the author deals with the cause of beriberi, and quotes the views of many medical men on the subject, among which are the following: Beriberi is probably caused by (a) a toxin produced by a germ outside the body and inhaled or absorbed by the skin (Manson); (b) by a food poison developed in rice (Voderman, Braddon, &c.); (c) by a bacterial infection (Pekelharing, Hamilton Wright); (d) by fungi growing on mouldy rice (Hose); and (e) that beriberi is caused by a deficiency of the diet in (1) fat, (2) proteins (Takaki), (3) organic phosphorus (Schaumann), (4) vitamin B. (Fraser and Stanton, &c.). Durell's view is that the disease is a group rather than a single entity, but so far it has not been possible to draw a dividing line between the different varieties of beriberi and the variations and manifestations of the disease cannot be understood until the cause or causes have been discovered. The author enlarges upon the principles to be followed in making recommendations for the control of the disease, and also gives measures which can be relied upon for the prevention of beriberi.

The known facts suggest strongly that a poison formed in rice under certain conditions of storage may be the essential cause of some forms of beriberi, and possibly of the disease in general.

The Pharmacology and Therapeutics of Boerhaavia diffusa (Punarnava) (R. N. Chopra).—The active principle of *Boerhaavia diffusa* or *Punarnava* is a body of alkaloid nature which has been called *Punarnavine*. There are also large quantities of KNO_3 and other K salts present in this plant.

Intravenous injections of the alkaloid in cats produce a distinct and persistent rise of blood-pressure and a marked diuresis.

The diuresis is mainly due to the action of the alkaloid on the renal epithelium, although the rise in blood-pressure may contribute towards it.

Clinically, 1 to 4 dr. of the liquid extract made from either the dry or the fresh plant produce diuresis in cases of œdema and ascites, especially

those due to early liver, peritoneal and kidney conditions. When the liquid extract is used the presence of a large number of potassium salts no doubt reinforces the action of the alkaloid.

The drug appears to exert a much more powerful effect on certain types of cases of ascites, i.e., those due to early cirrhosis of the liver and chronic peritonitis (Hale White) than some of the other diuretics known.

A Note upon Splcen Puncture Findings in Malaria (R. Knowles, Hugh W. Aeton and S. A. S. Biraj Mohan Das Gupta).—The authors are of the opinion that the aetiology of malarial relapses may be explained upon a purely mathematical basis. If the patient's powers of resistance are such that 98 per cent. of *Plasmodium vivax* parasites, for instance, are destroyed per forty-eight-hour cycle, then cure, and probably permanent cure, without relapse is assured. If the destruction rate is lower, and at a figure of only 90 to 94 per cent., the disease is still in its progressive stage. At a figure between 95 and 96 per cent. a condition of balanced equilibrium is reached at which schizogony is still proceeding at the normal rate; but the patient's powers of resistance are sufficient to keep the total number of trophozoites below the febrile threshold; whilst the brake-like factor introduced by gametocyte formation is also important in reducing the infection to afebrile limits. Should the patient's powers of destruction of merozoites become reduced from any adverse or extraneous cause, however, the destruction rate will fall; the schizogony success rate will be proportionately greater; a febrile dose of merozoites result; and fever recur.

Case of Infection with Bacillus pyocyaneus simulating Leprosy (S. Mallannah).—The author describes a case of a patient suffering from two perforating ulcers of the foot. All the symptoms pointed to leprosy, and he had been treated for such without much benefit for a year. On examining scrapings from the ulcer a large number of slender bacilli with rounded ends were found, which, on cultivation, proved to be those of *Bacillus pyocyaneus*. An autovaccine was prepared of *B. pyocyaneus* from the patient containing one hundred million organisms per cubic centimetre. This was given subcutaneously every week. The ulcers completely healed after eight injections.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 6, June, 1923.

Glucose Tolerance Tests and their Interpretation (J. P. Bose).—By means of glucose tolerance tests it is not only possible to differentiate simple glycosurias from true diabetes mellitus, but they also throw considerable light on the confirmation of diagnosis of some other diseases associated with disturbed carbohydrate metabolism. Definite types of blood-sugar curves can be obtained from certain disorders of the ductless glands, such as hyperthyroidism, hyperpituitarism and hypopituitarism,

and a rare variety of kidney disease, which have all along been masquerading as diabetes mellitus. These can be sorted out by this test.

Note on the Value of Essential Oils in the Prevention and Treatment of Cholera (J. W. Tomb).—Experiments were made by local practitioners for the Asansol Mines Board of Health with regard to the prevention and treatment of cholera. An old-time remedy was investigated which consisted of a mixture of essential oils with alcohol, ether and sulphuric acid, the following formula being used:—

R	Spt. ether	...	...	...	...	m3C
	Ol. cloves	...	...	...	...
	Ol. cajuput	...	...	...	...
	Ol. juniper	...	...	...	aa	m5
	Acid. sulph. aromat.	...	...	...		m15

Misce:

Dose.—One drachm, in half-an-ounce of water, until vomiting and purging cease.

For contacts.—One drachm in water once (or twice) daily for one or two days.

The results of this treatment were most successful. In several cases of cholera contracted by drinking water from a contaminated tank one or two doses at once stopped both vomiting and purging and aborted the disease. The mixture was then administered to several hundred contacts, and in no instance did any case of cholera develop among them.

Note on Myiasis of the Frontal Sinus (R. E. Wright).—The author describes the case of a child, aged 1, who was brought to the Government Ophthalmic Hospital at Madras with a suppurating sinus over the middle of the left eyebrow. The left side of the forehead and nose were extensively inflamed and oedematous. The lids on this were much swollen and closed, and there was excoriation of the skin all round the orbit. The eyeball itself was in good condition. The sinus in the brow showed a punched-out edge leading into a bony cavity in which live maggots could be seen. Some of the maggots were removed and investigated, and were found to be *Chrysomya bezziana*.

The maggots were removed by irrigation and drainage established into the nose and a gauze wick led through into the nasal cavity. Healing took place rapidly, and the child was discharged apparently well.

ANNALES DE LA SOCIÉTÉ BELGE DE MÉDECINE TROPICALE. Tome III, 1923.

The Use of Rhubarb in Bacillary Dysentery (R. Van Nitsen and C. Mortiaux).—Rhubarb powder has been found to be very effective in cases of acute and chronic bacillary dysentery (Dr. R. W. Burkitt's method, published in the *Lancet*, July 20, 1921). The dose consisted of two-thirds of a teaspoonful of powder in the form of a cachet, and administered every two or three hours until the stools were normal and the patient completely cured.

This treatment given with water is willingly

taken by the natives, and does not cause vomiting. It has given better results than treatment by second pills, opiate, vaccines and anti-dysenteric serums. The powder can be seen in the stools six hours after absorption.

Endemic Index of Malaria at Elizabethville (P. Walravens).—Examination made in blood-smears at the end of the rainy season, March, 1922, of 175 native children of the Force Publique, showed 50 per cent. to be infected with parasites; the thick-drop blood examination brought the total to 75 per cent. infected. At the end of the dry season, September, the blood examination was made of 667 black and white children, aged 0–15 years, from various parts of the town; 46 per cent. were infected, and of these only two were Europeans; this is accounted for by the preventive quinine taken by the European children.

In many of the positive cases the spleen was not enlarged, and in other cases the spleen was palpable but presented no parasites on microscopic examination.

The author concludes by recommending the necessity of prophylactic quinine; children above the age of 10 years should take a comfit containing 20 cg. of chlorhydrate of quinine daily, and those under 10 years should be given a comfit or chocolate containing 5 cg. of quinine; this should last from the beginning of September to the end of April.

Marshall's Method in the Treatment of Human Trypanosomiasis (F. Van Den Branden and L. Van Hoof).—Marshall's treatment of human trypanosomiasis (1920) by salvarsanized serum appears to have been used in previous years by other authorities.

Salvarsanized serum is not an irritant for the spinal canal, and has no trypanolytic action when injected intracranially. The peripheral sterilization obtained is attributed to the preliminary injection of salvarsan. Blood serum has no curative action when injected in the spinal canal, neither does it cause peripheral blood sterilization. Intralumbar injections of serum of chronic invalids, who have been treated and responded well to the treatment, has no curative action in a newly-infected subject. After injections of atoxyl, soamin, salvarsan, &c., the serum has no curative action, but there is a temporary peripheral sterilization of few weeks' duration due to the action of the first injection.

Malarial Index and Quinine Prophylaxis of Malaria at Leopoldville (F. Van Den Branden and L. Van Hoof).—Examination of sixty-six children at Leopoldville (1914) by Dr. Dubois showed 53 per cent. to be infected with malarial parasites, mostly of *Laverania malaris*. In 1915 Dr. Van Den Branden examined thirty-two children and found haematzoa in them all. The number infected was very much less in 1916 owing to quinine prophylaxis. In 1919 the plasmodium index was 38 per cent., and 1920 41·7 per cent. At the end of 1921 the authors examined the blood of 121 children, nearly the

whole of the infantile population, from 0–16 years of age, and found 52·2 per cent. to be affected. 205 of the children had splenomegaly in diverse forms. In only one case were gametocytes of *L. malaris* found, and *Plasmodium vivax* were very rare.

Sleeping Sickness between Bukama and Lake Kisale (G. Valcke).—The palpalis exists everywhere and in abundance, and both European and native buildings are constructed with the least precautions. Few cases of trypanosomiasis have been observed, and recently one case of death due to the disease. There is much to be desired in the clearing of brushwood in the working quarters, but although this is neglected it has not caused an epidemic of trypanosomiasis as might have been expected, the reason of this is yet to be determined.

For prevention of spreading of the disease, the author suggests that all the river working people should reside in one village and be subject to medical examination and treatment at fixed periods, and restrictions should be enforced for travelling and transport of all kinds.

Note on Bilharziosis in the Stanleyville Region (Belgian Congo) (C. C. Chesterman, M.D. Lond.).—In the course of two years fifteen natives entered the hospital of the Baptist Missionary Society, Yakusu, suffering from intestinal bilharziosis; in two of the cases the symptoms were slight, but the rest were more severe.

The eggs found in the urine of the patients were longer in shape than those of *Schistosoma hamatobium*. The intermediary host is probably a water mollusc resembling *Bullinus contortus*, the common host of *S. hamatobium* in Egypt.

Intestinal Parasitism in the Natives of Leopoldville (Belgian Congo) (F. Van Den Branden and L. Van Hoof).—Ascariasis and ankylostomiasis are the most frequent forms of intestinal parasitic affections found amongst the natives of Leopoldville. The majority of the inmates of the hospitals are affected, and the parasites are often found in apparently healthy individuals.

The eradication of the ankylostomes is rarely obtained, and the native life and hygienic conditions expose the natives to relapses and reinfection. Investigations of rural villages show the percentage of infected inhabitants to be equal to that of the towns.

Cases of amebiasis have decreased greatly in number since the use of emetine, and great benefit has been derived also from the use of bismuth.

Wanted Second-hand Copies of
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Original Communications.

LAMBLIAL DYSENTERY TREATED WITH CARBON TETRACHLORIDE.

By M. KHALIL, M.D., M.R.C.P., Lond.

Assistant Director of Investigation in Ankylostomiasis and Bilharziasis in Egypt.

AND

I. SHAWKY.

Physician to Children Section, Kasr-El-Aini Hospital.

INFECTION with *Lamblia intestinalis* is apparently not widespread in Egypt. The only reliable record of the extent of infection with this parasite in Egypt is that reported by Wenyon and O'Connor as a result of examination of 524 Egyptian prisoners in Alexandria jail (Hadra). Of these 0.57 per cent. harboured lamblia free or encysted. It is doubtful, however, if this result can be applied to other parts of Egypt.

It is unfortunate that most medical men in Egypt do not utilize the microscope for the diagnosis of cases of dysentery but rely solely on the clinical manifestation of the disease. For this reason it is not surprising that the cases detailed below had received before microscopical diagnosis different forms of treatment at the hands of different physicians without success.

L. intestinalis was the only pathogenic parasite found in these three cases. It was thought advisable to try the effect of carbon tetrachloride in the absence of any known specific treatment for that infection. The immediate results were gratifying. The dysentery was cured and the patients felt the better as a result of treatment. Examination of the stools showed that the lamblia and their cysts disappeared.

Although it is too early to arrive at any conclusion from such a limited number of cases, especially that lamblia infection is characterized by long intervals of freedom from diarrhoea and occasional absence of the organism from the faeces, yet the immediate relief from the symptoms after the administration of carbon tetrachloride demands an extended trial and observations of more cases at the hands of different observers.

Case 1.—M.T., a boy, aged 3. Patient had whooping-cough one month before. He had diarrhoea with blood and mucus for three weeks. No tenesmus. Child was treated with emetine with no effect. Intestinal disinfectants and astringents were given an extensive trial with no favourable result.

Stools were then examined. The motion was soft but not fluid, and no blood was found. There was a little mucus which contained a large number of lamblia cysts but no free forms. *Entameba coli* cysts were also found. The stools were examined on two further occasions with similar results.

Child was given 20 minims of carbon tetrachloride in water followed two hours later by a purge of magnesium sulphate. No other medicines were given. Three days later stools were found negative for lamblia although *coli* cysts were still present. All symptoms disappeared in a week. When heard of

two months later, the boy was reported to be enjoying good health.

Case 2.—M. A., a boy, aged 4. Had diarrhoea with blood and mucus for six weeks. Blood not always present. No tenesmus or prolapse. Stools examined by others reported negative for amœbic and bacillary dysentery. Patient had courses of emetine and antidyenteric serum with no amelioration of the symptoms.

Stools were then examined by one of us and lamblia cysts were found. The child was then given 20 minims of carbon tetrachloride in water followed two hours later by magnesium sulphate purge.

Stools were re-examined after two days and were found to be free from lamblia. All symptoms disappeared in a week. When last heard of three weeks later patient was reported to be well.

Case 3.—F. L., gentleman, aged 25. For nearly two years had attacks of slight diarrhoea with blood and mucus. No tenesmus. Attacks last a few days and recently recurred about every four weeks. Patient had undergone various forms of treatment in Egypt and in Europe. Stools were examined many times but apparently lamblia was not diagnosed.

He had had courses of emetine, emetine bismuth iodide, intestinal lavage, autogenous vaccine for organisms found in the stools, all with no effect.

Stools were examined and lamblia cysts were found. At the time of examination there was a little blood in the stool. He was then given 5 c.c. of carbon tetrachloride in water followed three hours later by a magnesium sulphate purge.

Stools examined two days later were free from lamblia. Symptoms disappeared and for the present the patient is cured. This may or may not be permanent, but the result so far has been so promising that we considered it worth recording.

The three cases are being carefully followed for anything of the nature of a relapse—so far a period of two months in one of the cases there has been no evidence of any recurrence of the infection.

THE TREATMENT OF ERYTHRO-MELALGIA TROPICA BY INJECTIONS OF ANTIMONY.

By J. TERTIUS CLARKE, M.R.C.S.Eng., L.R.C.P.Lond.,
D.P.H.Camb.

In the Malay Peninsula and, I am told, in certain parts of Southern India, there is a disease commonly spoken of as "burning pain in the feet." This disease is not mentioned in Manson nor in Stitt, but a short account is given in Castellani and Chalmers under the heading of "Erythro-melalgia tropica," a name apparently given by the late Dr. Gerrard of the F.M.S. Medical Department.

This "burning pain in the feet" is not very common, and occurs only among the South Indian agricultural labourers. I have not seen it either in Chinese or Malays. During the past eighteen months I have come across about thirty cases. The pain is very severe and causes great suffering. The sole of the foot is the part most usually affected, but some patients when asked where the pain is worst, point to

the dorsum of the foot and toes. In some cases pain is felt round the ankles. The gait is characteristic, most of the weight being carried on the heels and outer part of the feet; the patient while lying on a bed often holds both feet in his hands. The pain in most cases is worse at night, the patient often keeping the others awake by constantly groaning or crying; also in the day time he sleeps but little, and the result of this want of sleep shows itself in a distressed appearance. This pain lasts a long time; it seems to have intermissions and exacerbations; occasionally the pains will last for a year, and during the whole of this time the sufferer is unable to do much work, if any. The usual duration is three or four months and treatment has in the past been only palliative. Opium must be withheld as the length of time during which it would have to be taken would be almost certain to induce a craving.

The disease is symmetrical. I have not seen a case in which the pain was in one foot only.

On examination there is nothing to be seen; the plantar reflex is normal but that of the patella is usually increased. There is some wasting but no tenderness of muscles, there is no anæsthesia, no paralysis, no œdema, no rash, nor any cardiac or gastro-intestinal disturbance.

The cause of the disease is unknown; it never kills. Dr. Gerrard suggested that it might be a manifestation of malaria, but neither the blood nor the spleen nor the effect of quinine supports this idea. A few of my cases have had malaria, but treatment for this has not had any effect on the painful feet. I have looked on it as a manifestation of ankylostomiasis. Some years ago I met what seemed to be a mild case in a European who used to walk down to the bottom of his compound every morning in bare feet. He complained that his feet were so stiff and tender on first getting up that it took some minutes before he could put his full weight on them. This stiffness and tenderness ceased when he took his morning walk in leather slippers. This made me think that these pains might be due to embryos of ankylostomes taking a different course from the usual one and penetrating into and staying in the nerve sheaths.

This reasoning was purely fanciful and the symmetry of the disease gives an argument against the theory; but knowing that antimony is fatal to many of the lower organisms I began to use this drug in the hope of killing these supposititious ankylostome embryos.

I have treated thirty of these cases during the last eighteen months, giving them 1 gr. of antimony tartrate diluted in 20 minims of water by injection into the muscles of the buttock once a week. All of these cases have been benefited, most of them cured. Some have required six, some have been cured with two injections. One case of four months' duration was apparently cured by one injection.

When I first used tartar emetic I gave only $\frac{1}{2}$ gr. doses and one case so treated obtained no benefit after three doses, but six months later was given three doses of 1 gr. each and had no pain after the second injection. This man had been suffering from pain for over seven months. Another case had three injections of $\frac{1}{2}$ gr. only and was apparently cured in a week, but two weeks later relapsed and on being given a single

1 gr. dose was again apparently cured but again relapsed and left the estate. I think that 1 gr. once a week is more efficient than $\frac{1}{2}$ gr. twice a week.

The cure generally is very rapid and is usually complete in two or three weeks; three cases have been apparently cured by one injection, but one case of two months' duration took three months before the pain had left him. He had had nine injections. The first seven were given within a period of six weeks and as there was no improvement they were stopped. At the end of a further five weeks he was given two more injections and lost the pain. The cure of this case may have been due as much to time as to the tartar emetic, but it is the only case which seemed to be a failure. The injections cause pain but the patients generally put up with that as it is not nearly so severe as the burning pain in the feet from which they are suffering.

I have not tried intravenous injections nor any other preparation of antimony but intend to do so as they may be less painful.

Dengue Fever in Galveston (L. Rice, *American Journal of Tropical Medicine*, March, 1923).—The author reports on the epidemic of dengue fever which occurred in Galveston during the summer and fall of 1922. The diagnosis was made on five principal points. (1) Sudden onset with fever and a chill or chilly sensation; (2) aching pains which may be general or localized in the head, back or legs; (3) suffused face and eyes; (4) normal or low leucocyte count with a relative lymphocytosis; (5) absence of jaundice and albuminuria. Soreness of the eyeballs and skeletal muscles; prostration and loss of appetite; and alteration of taste also occur. These symptoms are usually confirmed by the appearance of atoxic rash and the termination of fever within three to seven days.

Treatment consisted of salicylates, acetphenetidin and codain sulphate for the pain; sponges, ice-caps, free intake of fluids, laxatives (not purges) and rest in bed.

Experimental Studies with Mercurials in Experimental Syphilis (Justina H. Hill and Hugh H. Young, *Journal of the American Medical Association*, vol. lxxx, No. 19, May, 1923).—The marked anti-syphilitic action of flumerin has been demonstrated further, fifteen doses of 5 mg. per kilogram being employed. The slight action of mercuric cyanide, given in twenty-one doses of 0.2 mg. per kilogram, and the lack of therapeutic action of mercuric salicylate during the first part of treatment with twelve doses of 0.6 $\frac{2}{3}$ mg. per kilogram, under which all animals grew markedly worse before enough mercury was absorbed to check the infection, are shown. The slow but complete resolution of lesions under treatment with red mercuric iodide given in twenty-five doses of from 0.1 $\frac{1}{2}$ to 0.2 $\frac{3}{4}$ mg. per kilogram has indicated the anti-syphilitic action of this drug, although the permanence of its action has not yet been demonstrated.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 15, 1923.

MINISTRY OF HEALTH.—MEMORANDUM ON CANCER.

AN excellent Memorandum has just been issued by the Ministry of Health of which copies may be purchased through any bookseller or directly from H.M. Stationery Office, Imperial House, Kingsway, London, W.C.2. Circular 426. (Price 1d. net.)

Cancer is being dealt with to-day by Government in a manner never previously so seriously nor so thoroughly handled.

Directions to obtain copies of the Memorandum seem simple in the extreme. Send 1d. net is all we have to do; but how is one to get one penny (1d.) in a tropical country? It is easy to send requests to London but how is an "enclosed (British) stamp" to be obtained to send to London to carry the return letter to its destination abroad? It is no good enclosing a S. African, a Ceylon, or a Hong-Kong stamp. For the local stamp of any colony or foreign Government will not carry mails out of Britain to a foreign country; and there is no British paper money nor coin that is available to send to London from abroad; for the amount "one penny" (1d.) or stamp cannot be found in any foreign country or colony, &c. It is a small point seemingly, but according to present-day methods a well-nigh impossible point to overcome. Perhaps the day will come "when country to country the world o'er will brothers be" and it will be possible to enclose stamped letters to carry return letters. No one seems to have considered this small point; but is it a small point? Those of us who have much dealings with abroad are aware of the fact how frequently we receive, say, Mexican, Italian, Argentine, Japanese, even U.S. stamps, enclosed to put on the envelopes in which the answers are to be sent from, say, Britain, to the country of the sender of the original query, so that no money is to be spent by the sender of the reply, and a reply hindered there. "Please send me the Memorandum mentioned in my note. I enclose stamps in reply." But British, that is to say, English stamps are not possible to obtain abroad in, say, tropical countries, and local stamps from, say, China, will not carry letters, &c., through the British Postal system. Civilization may one day attain that acme of international postal transmission. The British Postal system, with all its international freedom of communication, has not yet devised a means of overcoming this obstruction and is not ever likely to be so liberal as to pay even that penny.

The writer, in his dilemma, wrote to the Chairman of the Departmental Committee on Cancer, appointed by the Minister of Health, and pointed out the postal difficulties of such communication. Meantime, the writer went to H.M. Stationery Office to purchase the Memorandum in question. After a little inquiry the Stationery Office was found in Kingsway, W.C.2, and he was told the document was *out of print*. Strange!! for the pamphlet had only been issued some few days before—there had, in fact, been a run on the issue, a quite unusual run for a Government Committee publication. This was on September 12, 1923. Whilst at the Stationery Office the writer broached the question of how the medical man resident in the tropics sent his payments to the Government for such issues, and how did they issue (post) the pamphlets required to go abroad. The stereotyped answer was: ["See Circular 426. Copies may be purchased through any bookseller or directly from H.M. Stationery Office. Price 1d. net."] The writer then broached the question mentioned above, viz.,

how can the resident abroad send 1d. to London and how can one be sure that the Government official would stamp the document in question? The official addressed had never heard of such a difficulty and could not help the writer in a matter of this kind. An older man adjacent said there was, he believed, a means of doing it by what is called a "Coupon-Réponse International," purchasable at any post-office throughout the Kingdom and he believed in all principal post-offices throughout the world. The writer thereupon said, "Oh well! I will go to my bookseller and get a copy." The official then said, "It is no use going there as they can only get a copy through us." "Oh! but they may have some in stock." "The booksellers never keep any such penny documents in stock. The demand is usually so limited that only actual orders are executed. No surplus is kept. The writer wanted a copy at once; but it could not be had until the Government issued fresh copies. "When would that be?" No one knew that. The writer then went to the library of the Royal Society of Medicine, but they had not yet received any copies of the Memorandum in question nor as yet heard of such an issue. The writer again asked how they dealt with postal communications to the medical men in the tropics, seeing that neither the 1d. in coin nor in money orders nor stamps sent from, say, the Cape, Brazil, the Far East, &c., could be had. However, the learned head of the library mentioned the fact that "coupons" were issued for the purpose, and the writer thereupon went to the nearest Central Division post office, and, after a little discussion, was able to purchase an *International Reply Coupon*.



printed in French, for 3d. At last the writer had unearthed the fact that there is a provision for such postage, although this is practically unknown to the public and not always to the Post Office or Government officials.

The reader will see that it would have been easier, and saved a lot of printing, had the last part of this article been set forth to begin with. It is believed better to explain this little known bit of information fully and to recommend that the Government should issue its notification as below:

Circular (number?). Copies may be purchased through any bookseller or directly from H.M. Stationery Office. Price 1d. (or whatever the price may be). Residents in other parts of the Empire or in foreign countries should purchase a "*Coupon-Réponse International*" at their local post offices.

The friends and neighbours the writer has spoken to on the subject have declared they were ignorant of the existence of such a coupon, so that the publication of such a fact is an important matter. When one has to do is to enclose the above coupon with the address to which the reply is to be sent.

The matters considered in the Memorandum issued by the Ministry of Health have been welcomed by both medical and lay folk; the rapid exhaustion of its sale testifies to the good it is calculated to do. Perhaps not the least of the benefits accruing to its publication is the fact that it is published in no technical language, so that it can be understood by the many and sundry. Many of the points referred to in the Memorandum were at one time tabulated by the late Dr. Fletcher Little, more especially the section in the Memorandum entitled, "Chronic Irritation as a Determining Factor" of cancer. Many men have turned the same subject over in their minds, but few have systematized or put it on paper. Lately the writer has come across another man, Dr. S. P. Impey, long resident in Cape Town, whose testimony is in the same vein as regards leprosy and cancer. It is interesting to note that Dr. Impey advocates early treatment by X-rays, and as the dread of the knife is great in practically every living being, the tendency is to delay bringing cases of cancer sufficiently early up for treatment, and operation is postponed beyond "the hopeful time" for cure. As there is no such dread of X-ray treatment, it is in this direction that treatment should be applied. It is impossible here to give Dr. Impey's whole paper, but as treatment is the "be all" of every procedure in practice, the following may be quoted:—

"It has been the custom to treat cancers by giving very large doses with a short exposure, and at a long interval, but this method gave such poor results that the rays fell into disrepute, and the knife became firmly established as the best means of treating cancers.

"Now the pendulum has swung to the other extreme, and instead of applying the rays at long intervals these are applied in one continuous session extending over several hours or several long exposures.

"This method may, in certain instances, give good results, but in my opinion the best results will always be obtained by sticking to the happy medium—small doses, medium strength exposures extending over a long period.

"This is the method I have used for sixteen years with very considerable success.

"In superficial cancers, and in all operable cases, the rays give better results than any other form of treatment. I cannot see why in deep-seated cancers

the results should not be equally good, for the rays pass through the tissues, but as a matter of fact the results are not nearly so good. I am of opinion, however, that with an improved technique good results will in the near future be obtained even in deep-seated cancers."

	Cured.	Not cured.
Rodent	195	7
Lip cancers	222	13
Mouth, throat, gullet, and larynx... ..	1	11
Breast	23	5
Superficial cancers	41	6
Penis	0	2
Parotid	4	5
Thyroid	2	3
Lymphadenoma	5	3
Jaws	1	3
Sarcomas... ..	1	1
Tongue	5	2
Uterus	2	2
Stomach, rectum, umbilicus	1	5
Lupus	2	0

When the disease occurs in organs such as the uterus X-ray exposures applied early to the os are mostly attended by success, but if the body of the uterus is attacked success is hopeless.

The reader may search in vain for Dr. Impey's name in the Medical Directory of this year, but in the 1924 edition it will be seen unless through mishap. The explanation is a curious coincidence. In the Medical Register (not the Medical Directory) of 1924 Dr. Impey's name is inserted as being an M.B.C.M. of Aberdeen. It seems when he finished his career and was capped at the University, he never knew there was such a formula to be gone through as that of registration, and went to the Cape Colony to practise medicine. Only in March, 1923, did he hear such a step as registration was necessary, and we have verified this very extraordinary tale by visiting the General Medical Council offices and seeing for ourselves. This is not the only case of the kind, and it is often months and even years before a medical man becomes aware of the necessity for registering at the Council offices.

There are many anomalies in the declaration of cancer of a peculiar nature. The fact of a woman with a "lump" in the breast coming "at once" to show it voluntarily to a doctor is against the "lump" being of malignant nature; for, as every one knows, there is an instinct of secretiveness attached to tumours of a malignant type which prompts the sufferer to hide the lump if it be of a malignant nature from even other members of the family. A woman may hide the growth for months or even years, and it is only when the smell of the ulceration of the skin can no longer be bidden from other members of the household that the discovery is made. Again, mistakes in diagnosis are not unheard of, as the following case unfolds. A woman of 60 years of age fell on the stairs and fractured her coccyx. For a long time—some eight months—pain persisted, and then some ulceration at the anus occurred and induced the patient

to examine that part with her finger, pushing it within the anal orifice and there a hard mass was felt. The patient, the wife of a doctor, told her husband, and after he consulted with several friends it was decided to remove the mass, which however was not ulcerated; there was no bleeding; the mass did not completely encircle the bowel, which was readily felt as a semicircular mass within 2 in. of the orifice. The lower 12 in. of the bowel was hurriedly removed; the microscopic examinations failed to unfold any malignancy in the laboratory; no local recurrence took place and patient died without any signs of malignancy some five years afterwards of another complaint altogether. It behoves all medical men to relate their personal experiences of the cases of cancer which they have had in their practice, and we believe that the Ministry of Health would do well to issue a circular with definite headings, to be answered, not to doctors practising in Britain only, but in Overseas Dominions as well, and the Ministry might invite other nations to co-operate and help thereby to tackle this cancer problem collectively. The increase in the spread of cancer seems to justify such a step, for of all ailments it is the most widespread and terrible malady that attacks mankind. So far the microscope has proved a very unsatisfactory help in either diagnosis or as an aid to treatment. For, although it is now many years since the trial was made, the Pathological Society of London appointed a committee of well known pathologists to examine all "tumours" sent into the Society, whatever their nature, for a period of twelve months. Some are old enough to remember the results of the report and the astounding findings. The nature of the tumour examined, its origin, its clinical features and results were not told; nothing to guide the pathologists in any way what the possible "lump" might be was even whispered to them. Sir James Goodhart was the Chairman of the Committee and his story was a confession that in every case the report of the microscopic finding declared simple growths to be malignant and every malignant growth proved to be a simple one. The microscope as an instrument of precision in the diagnosis of cancer lost its reputation.

We have ventured to quote Dr. S. P. Impey's personal observations and opinions as fully as the following extract from the "Report on Cancer" just issued and published almost fully by the *British Medical Journal*, page 423, September 8, 1923, permits of:—

"Evidence is accumulating that in some varieties of cancer, and in some situations, radium or X-ray treatment, or diathermy, carried out by expert medical practitioners, offers at least as good a chance to the patient as surgery, without the attendant disadvantages, and in other cases it may be tried when surgery is out of the question. The essential point is that the patient should not postpone or delay seeking competent medical advice, and, above all, should not waste time or money by trying quack remedies which at best are useless, and at worst aggravate the disease. In any condition in which

cancer is suspected, immediate and decisive action is necessary."

We propose printing the valuable Memorandum from the Ministry of Health in our next issue in place perhaps of leader.

J. CANTLIE.

Annotations.

Investigations on the Control of Hookworm Disease. XX.—Human Infestation Studies in Porto Rico by the Egg-counting Method (G. C. Paume, M.D., William W. Cort, Ph.D., and William A. Riley, Ph.D. Reprinted from the *American Journal of Hygiene*, vol. iii, No. 3).—The author comes to the following conclusions:—

(1) A quantitative estimate of the human infestation factor, and the potential dissemination of the parasite, is important in understanding the aetiology of hookworm disease.

(2) The Darling worm count method, while giving an accurate determination of the degree of human infestation in individual cases, is difficult to apply as a routine procedure.

(3) The egg count method devised by Stoll to determine the number of parasite eggs present in a given quantity of faeces was used in Porto Rico to determine the output of hookworm eggs from several population groups.

(4) Since the knowledge of the output of hookworm eggs of any given population group gives a measure of the potential dissemination of the parasite, this information, as obtained by egg counts, is of importance in planning control measures.

(5) In addition, the egg counts of the groups studied gave information relating to the degree of infestation, which agreed closely with all other data available, and, we believe, was a true picture of the mass infestation.

(6) The data showed that the males had a considerably greater average egg output from the ages 20-45 than the females, although in the most heavily infested area the output of the females was higher.

(7) When the data from the egg counts were arranged according to age groups it was found that the output in the youngest groups was low, but gradually increased year by year up to eight years. During adult life there was not much appreciable difference in the age groups, but after 50 years there was a distinct increase.

(8) The quantity of the egg output in the different age groups and in the males and females can be correlated with the habits of the people in relation to the visiting of important centres of soil pollution and soil infestation near their houses.

(9) The differences in the egg output of the five areas studied agreed with what was known of the conditions in these areas, and was definitely correlated with the amount of previous treatment and sanitation.

(10) In area C, the most heavily infested of the five areas, egg counts were made before and after treatment, and showed a reduction of 91.9 per cent in the egg output after treatment.

(11) The attempt to express the egg output in terms of the number of worms present, by using a factor worked out by Stoll on test cases in Porto Rico, gave figures in essential agreement with all available information.

(12) The suggestion is made that the egg-counting method be made a regular part of the routine procedure in surveys made before the introduction of control measures, or for the evaluation of such measures.

Value and Limitations of the X-ray in the Diagnosis of Chronic Appendicitis (L. Levyn, New York Medical Journal and Medical Record, vol. cxvii, No. 11, June 6, 1923).—Many symptoms are common to numerous abdominal conditions. The X-ray is of value in their differential diagnosis, and is most always is capable of eliminating certain organs and detecting the offender.

Obscure symptomatology may be due to unsuspected appendix disease discovered in the course of an examination of the gastro-intestinal tract.

Tenderness over the McBurney point does not necessarily indicate appendicitis, because the appendix may be remote from this site. Its location can be determined by fluoroscope.

An appendix that retains barium after the caecum has emptied is not necessarily diseased.

Size and position in the absence of certain signs are of scarcely any significance.

Left-sided appendix can be demonstrated by another method.

Efficacy of Anti-variole Vaccination in the Philippines during 1921 and 1922 (Regino G. Padua, M.D., *Journal of American Tropical Medicine*, vol. lxxx, No. 19, May, 1923).—The author comes to the following conclusions:—

(1) It is firmly believed that protection of the public is afforded by systematic and successful anti-variole vaccination. There are no other factors to which the eradication of smallpox in Manila and the rapid reduction of the morbidity and mortality rates in the provinces during 1921 and 1922 may be chiefly ascribed.

(2) Failure to get a higher percentage of positive "takes" than 70 has been due in large measure to the inability of maintaining the potency of the vaccine virus, now employed, under tropical conditions. But this cannot oblige the Philippine Health Service to lay aside the hope that, with persistent efforts in vaccinating the non-immunes, the time will come when the public in general will be completely immunized to withstand subsequent epidemics. It is roughly estimated that this may be attained every six or seven years if the present system is continually kept up. Moreover, our sanitary inspectors (vaccinating parties) are now becoming more trained and experienced in the

appreciation of positive "takes" and in the technique of the vaccination process.

(3) In general, the specific morbidity and mortality rates of smallpox among the vaccinated have been the lowest in infected provinces in which the percentages of immunized population have been the highest, and conversely. On the other hand, all things being equal, the specific rates of the unvaccinated have been high in infected localities in which the percentages of immunized population have been low, and conversely also. Rare exceptions to this were due to the large number of susceptible children who became subsequently attacked with a more virulent strain that could not be overcome by the vaccination immunity, and those who because of religious and various other causes escaped vaccination.

(4) On the whole 61 per cent. of the cases during 1921 occurred among children, a great proportion of which were never vaccinated, or were unsuccessfully vaccinated. The problem, therefore, fundamentally centralized in the compulsory vaccination of children, such as is now being practised to include infants of even 1 month old or under. And it is hoped that with subsequent modification of the vaccine virus to resist deterioration in hot weather the actual endemic occurrence of the disease, in certain sections of the islands, will be completely done away with.

Distribution of Actinomycosis in the United States (Arthur H. Sanford, *Journal of the American Association*, August 25, 1923).—This disease is widely distributed in the United States, being especially prevalent in the Upper Mississippi valley and the north-west portion of the country. It is far more common than one is led to believe from the scattered reports that have appeared in American literature. The fact should make all physicians more alert in the diagnosis of the disease, which is very easily made from a microscopic examination of the discharges. The public generally might be warned of the danger of chewing straws, weeds and grain as a possible means of infection with *Actinomycetes*. Much is yet to be learned, however, with regard to the source of infection in man and animals, and also much is to be done in the proper classification and the bacteriologic investigation of the different species of this group.

Actinomycosis of the Abdominal Wall (Henry Albert and J. B. Hardy and J. W. Harrison, *Journal of the American Association*, August 25, 1923).—Hitherto few cases of actinomycosis of the abdominal wall have been reported; the authors describe two new fatal cases. The part of the abdominal wall usually involved first is the right lower quadrant overlying the appendiceal region, but in some cases the abscess has made its first appearance in the region of the umbilicus, and in others in the vagina. Actinomycotic granules should be looked for whenever an abdominal sinus persists in spite of free drainage. To establish a diagnosis, the pus should be diluted

with water to see if light yellowish granules are present. The gauze drains should likewise be washed. If necessary, the lining wall of the sinus should be curetted, and a determined search should be made for the ray fungus. Treatment consists of irrigating the abscesses after opening up with solution of copper sulphate and establishing free drainage. Large doses of potassium iodide are administered orally.

The Occurrence of Blastocystis in Intestinal Inflammation (Kenneth M. Lynch, M.D., *Journal of the American Medical Association*, August 18, 1923).—The author describes a case of a young man in good general condition, with negative history, with acute diarrhoea after an automobile accident. The roöntgen-ray examination revealed an apparent spasticity of the intestine, and the mucous membrane of the rectum was red and inflamed and showed numerous small ulcers. The fact that blastocystis occurred in small numbers and of small size in the passed stool, but in large numbers and in large, actively dividing form in preparations taken directly from cleaned rectal ulcers of unexplained origin, seems to warrant suspicion of its connection with the ulcerative process. The organism was identified as *Blastocystis hominis*. *Endolimax nana*, although present in the stool, did not occur in the ulcers.

The Endocrine Causation of Scleroderma including Morphra (F. W. Castle, *Journal of Dermatology and Syphilis*, vol. xxxv, 1923, No. 418).—The author describes twelve cases of scleroderma supposed to have been due to some deficiency of internal secretions. Eleven cases occurred in female and one in a male. In seven cases the disease was first noticed on the face or at the back of the neck. No cause could be assigned for the disease except in one case, where a severe fright was held to be responsible. Two of the patients suffered from tuberculosis, and two others were closely related to tuberculous patients. In no case was there any clinical or serological evidence of syphilis. Pigmentation occurred in four cases. Disease of the thyroid was found in three cases; no other evidence of endocrine deficiency was found, except possibly in one where adrenal deficiency was suspected.

Considering these and other cases published, the author considers that the essential cause of scleroderma is a combination of a disordered function of the internal secretory glands, together with an affection of the nervous system. In many cases the underlying cause for the endocrine failure is a long continued poisoning, either from dental, intestinal, or tonsillar sepsis. The cases in which there has been long-continued slight trauma may be accounted for by the trauma taking the place of the endocrine failure and affecting the cutaneous nerves directly. Whether this affection is of central ganglionic origin in the form of a tropho-neurosis, or whether it is an affection of the cutaneous branches, still remains to be determined.

Carbon Arc-Light Baths in the Treatment of Lupus Vulgaris (J. H. Sequeira, *Journal of Dermatology and Syphilis*, No. 413).—Patients treated at the London Hospital by Finsen's method for lupus vulgaris have been divided by the author into three classes: *Class A.*—Permanent cures, 70 per cent. *Class B.*—Cases temporarily cured which require occasional treatment for recurrences of small dimensions, 11 per cent. *Class C.*—Those who benefit by the treatment but have never been free from evidence of disease, 16 per cent. The remaining 3 per cent. are intractable cases.

Cases which have failed to be influenced by the local application of concentrated light have recently been treated by light-baths. The effects observed are: Intense pigmentation of the whole surface. Rapid healing, especially of the moist rather fungating lesions. Increase in body weight. Improvement in the general condition. Listless, apathetic lads become bright and keen on their cures. In some instances an increase of the lymphocytes in the blood count.

The Treatment and Prevention of Malaria (H. A. Spencer, *South African Medical Record*, February 24, 1923).—Many of the cases of malaria and relapses are due to the patient omitting to take precautions against the disease. That malaria can be absolutely cured is positive, but it rests with the patient to follow the medical man's advice.

The author suggests that schools, hostels, gaolers' quarters, &c., should be provided with wire screens to windows and doors; they last for several years without requiring renewal. Mosquito nets are unsatisfactory. Quinine, in the treatment for malaria, has always been found to give the best results. The author has never given it subcutaneously unless it cannot be taken by the mouth. In giving organic arsenic intramuscularly, no discomfort is produced if it is sufficiently diluted and the needle withdrawn very smartly after injection. Rain water properly filtered and boiled should always be used. Small doses of organic arsenic are quite as effective in general treatment as large doses, and do not interfere with the daily routine of the patient. Combined with the use of quinine, galyi is used where there is considerable enlargement of the spleen.

Notes on the Administration of Vaccine per Os in an Outbreak of Enteric Fever (Dr. J. H. Harvey Pirie and Dr. A. J. Orenstein (*Medical Journal of South Africa*, April, 1923).—Early in November, 1922, an outbreak of typhoid occurred among the natives employed on a gold mine near Germiston. The most probable source of the infection was unknown carriers, and the immediate medium was flies. Early in January the natives were vaccinated *per os* by Professor Besredka's method. The vaccine was restricted to *Bacillus typhosus*. The doses consisted of 40,000 million bacilli, and were administered for two or three successive days. The vaccination gave excellent results.

The advantages of administering anti-typhoid vaccine *per os* are, that the natives do not object to taking medicine by the mouth, but strongly object and evade subcutaneous inoculations, also a certain number of men are unable to work for a few days: no malaise is caused by the administration of the vaccine by the mouth.

Observations on an Outbreak of Typhus in Simla (E. S. Philipson, *Indian Journal of Medical Research*, vol. xi, No. 1, July, 1923).—The Simla outbreak consisted of 16 cases (8 males and 8 females) restricted to a single Mohammedan family and attended with a case mortality of 37.5 per cent.

The origin of the outbreak is not certainly known, but the available evidence points to the virus having been introduced by a healthy third party from a focus of infection twenty-five miles away, the medium of transmission being, presumably, infected lice.

The existence of the epidemic was not recognized until several deaths had occurred, and the clue to its existence was afforded by the application of the Weil-Felix reaction to the sera of two recovered cases.

The sera of 12 cases known or suspected to be suffering or to have suffered from typhus were tested for the agglutination by Garrow's method against *Bacillus proteus* x 19 in every case with a positive result, varying according to the stage of the disease from 1:16 to 1:2048, with one exception, an almost moribund case, which was only tested once and reacted in no higher dilution than 1:4.

The sera of 100 healthy subjects, chiefly Indians specially selected as likely to provide the most exacting controls, were tested for agglutination against *B. proteus* x 19 with the result that all failed to show the least trace of agglutination in a dilution of 1:16; 8 per cent. gave a feeble reaction in 1:8; 33 per cent. reacted in 1:4; and 59 per cent. failed to react in 1:4.

The Weil-Felix reaction in Indians is of value in confirming a diagnosis arrived at by clinical observation and also in establishing a diagnosis in atypical cases in which the clinical evidence of typhus is doubtful.

The Diagnosis of Small-pox by the Paul Method (J. M. Scott and C. E. Simon, *American Journal of Hygiene*, vol. iii, No. 4, July, 1923).—The so-called Paul reaction when controlled by histological examination constitutes a most valuable method for the diagnosis of small-pox.

In many cases the macroscopic picture of the inoculated rabbit cornea in the sublimate bath is in itself sufficient to reach a diagnosis.

A negative result will in most cases exclude the diagnosis of small-pox, if satisfactory material was available for the examination.

As in other diagnostic laboratory tests, the validity of the results will depend in part upon the experience of the worker and the technique employed in procuring the material for examination.

In varicella, negative results are so constant that a doubtful reaction should arouse suspicion and lead to temporary quarantine until a re-examination can be made.

Pyogenic infections of the skin may produce a picture which could be mistaken macroscopically for a positive reaction, but the histological examination will probably always enable the observer to reach a definite conclusion.

The same is true of mixed variolæ and pyogenic infections.

The Paschen test, so far as limited experience will warrant the drawing of conclusions, is not so well adapted for use in public health laboratories as the Paul test, but may give satisfactory results in the hands of very experienced workers and with material that is obtained in a faultless manner.

Fatal Theileriasis of the Mediterranean Littoral (E. Brumpt, *Ann. Parasit. humaine et comparée*, vol. i, No. 1, April, 1923).—The author gives details of investigations carried out with a view to protecting pure-bred French cattle from the fatal diseases which attack them in the countries bordering on the Mediterranean.

Successful results were obtained in protecting the cattle from *P. bigeminum*, *P. argentium*, and the anaplasmas, but not against *T. mutans*. In the blood of one bull a typical reaction to *T. mutans* occurred after inoculation but on the 117th day a relapse due to the same parasite took place and the animal died within forty-eight hours. The blood was found to be teeming with parasites, and plasma bodies were found in the large mononuclears in the peripheral blood.

The morphological and biological features of *T. mutans* and *T. parva* are compared; the discovery of plasma bodies in a *T. mutans* infection makes the differential diagnosis of the two conditions more difficult.

In Transcaucasia, China, Eritrea, and the Mediterranean Littoral generally the discovery of plasma bodies has been taken to mean presence of African Coast fever, and in East and South Africa plasma bodies have been considered as pathognomonic of *T. parva*. Further investigations will now have to be made in these countries.

Attempts are being made to produce a *T. mutans* infection in animals which have recovered from *T. parva*.

Anti-Hookworm Campaign in the Tea Estates of Madras (K. S. Mhaskar and J. F. Kendrick, *Indian Journal of Medical Research*, vol. ii, No. 1, July, 1923).

—The average incidence and intensity of hookworm infection is much the same in coolies on the tea estates as in the districts they come from. Adult men harbour on the average sixty-eight worms per person, women forty, and children thirty worms per person. The infection varies in intensity among the different communities and is highest (169 worms per person) in the Panchamas, who, as a class, have little or no conception of cleanliness.

The hæmoglobin average of 70 per cent. is the same as that in coolies in the plains. There is no correlation between the hæmoglobin average and the number of hookworms harboured.

One dose thymol or betanaphthol treatment without purgatives is simple and effective, one treatment being sufficient to reduce 90 per cent. of hookworm infection. The betanaphthol treatment should for the present, like the thymol one, be considered not altogether safe. As no previous microscopic examination is necessary, and as the drug need be administered but once, the treatment is likely to find favour with the masses.

Treatment administered in the morning on a fasting stomach yields the best results.

All other things being the same, the thymol treatment at 1 ana and 11 pies per head is decidedly more costly than the betanaphthol treatment at 8 pies per head.

Freedom from hookworm infection diminishes the morbidity and mortality rates, and increases the marketable value of labour.

Favus of the Glabrous Skin without Cups (Jenselme and Marcel Blach and J. Hutinel, *Bull. Soc. franc. de Dermat. et Syph.*, vol. xxx, 1923).—The authors describe five cases of favus. One patient with long-standing favus of the scalp noticed an outbreak of small pruritic erythematous-squamous patches on the skin and a similar eruption rapidly appeared in the other four cases.

Achorion was found in all the lesions and treatment consisted of the application of iodine.

An Attack of Polyneuritis coinciding with an Erythematous-squamous Dermatitis after a Series of Neovarsphenamin Injections (Bernard Ballet, *Bull. Soc. franc. de Dermat. et Syph.*, vol. xxx, 1923).—The author describes a case of syphilitic ulcer of the leg. Pains were noticed in the left thigh at the close of the arsenical course and formation of the extremities with hyperæsthesia of the toes and fingers, motor disturbances, &c., were noticed. Treatment was suspended, resulting in marked improvement both in the neuritis and the eruption.

Prurigo Nodularis (E. W. Netherton, *Archives of Dermatology and Syphilology*, vol. viii, No. 2, August, 1923).—From the study of the histopathology of two cases of prurigo nodularis, it seems highly probable that the initial disturbance which terminates in this affection begins in the sweat coils, causing the excessive pruritis and rubbing in the localized areas, and the subsequent formation of the thick heavy nodules seen and felt in the skin. This primary disturbance and change in the sweat coils may be due to various factors, either of a nervous origin or the results of some trophic change or chemical action of some sort in the coils.

The tendency to linear arrangement of the lesions observed in some cases is quite striking, and should be noted as a feature which may have some clinical significance.

Musings on the Problem of the Transmission of Kala-azar (L. E. Napier, *Calcutta Medical Journal*, January, 1923).—The fact that this disease is almost always associated with insanitary surroundings, and is a house and family infection, naturally suggests the bed-bug as the transmitting agent, but bed-bugs are universal and kala-azar is not. Also there is another fact to be explained, viz., why the bed-bug can transmit the disease in Calcutta and Madras, and yet is incapable of doing so in Bombay.

The author is of the opinion that the bowel is a possible route by which the parasite leaves the body, and oral infection is not at all improbable. Season, race, sex and age distribution do not throw much light on the subject.

The Pathology of Acute Experimental Kala-azar in Monkeys (H. E. Shortt, *Indian Journal of Medical Research*, vol. ii, No. 1, July, 1923).—Inoculation of monkeys with infective kala-azar material derived from human cases may sometimes produce an acute and rapidly fatal form of kala-azar.

The disease experimentally produced in monkeys is essentially the same as that found naturally occurring in man.

Kala-azar is essentially a disease of endothelial tissue, and especially of vascular endothelium.

Significance and Value of a Positive Wassermann Reaction in Kala-azar (K. R. K. Iyengar, *Indian Journal of Medical Research*, vol. ii, No. 1, July, 1923).—Kala-azar infection is not a cause of a positive Wassermann reaction.

An unselected and apparently healthy Indian male adult population has given a positive Wassermann reaction in eighty-eight cases out of 400, or 22 per cent. It is therefore inferred that a figure of not more than 20 per cent. occurring in an unselected Indian male adult population suffering from kala-azar must be due to the existence in this population of latent or clinically inactive syphilis.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 7, July, 1923.

Evidence of Cure in the Treatment of Kala-azar by Antimony (F. B. Mackie and Hari Charan Patni).—The value of antimony salts in the treatment of kala-azar is a well-established fact, but by very reason of its efficacy practitioners are liable to overlook the fact that its action is by no means identical in different cases and that there is no hard-and-fast limit to its administration.

It is now known that the course of treatment at one time laid down as sufficient to cure is not always effective and that there is a fair proportion of cases which are very resistant to antimony, whilst in a

smaller percentage still the drug as ordinarily administered has no appreciable effect either on the clinical course of the disease nor on the parasites which cause it.

Those practitioners who have been taught that a course of antimony almost automatically cures kala-azar should remember that:—

(1) The generally accepted "full course of treatment," namely 200 c.c. of a 1 per cent. solution of sodium antimony tartrate, is in many instances ineffective in curing a case.

(2) That each case must be treated on its merits and a hard-and-fast limit of treatment abandoned.

(3) That treatment should be continued till all or most of the clinical criteria of cure, such as cessation of fever, reduction in size of spleen, &c., are evident.

(4) That even when all these favourable signs are present the patient may still be harbouring living *Leishmania* and therefore the only real evidence of cure is the failure to grow the parasite from material obtained by spleen puncture.

(5) That microscopic examination of the spleen juice is, by itself, insufficient to prove cure.

That there is real danger to be apprehended from insufficiently cured cases, as these may in all probability act as chronic carriers of infection in the community.

The Globulin Opacity Test for Kala-azar (U. N. Brahmachari and P. B. Sen).—The easily precipitable globulins discovered by one of the authors some years ago are responsible for the aldehyde test. They are the same globulins that give rise to the globulin precipitation test and globulin ring test.

The total content of water-precipitable globulins is generally greater in kala-azar than either in health or other diseases.

The test itself is as follows: One part of serum is mixed with six parts of distilled water, when a turbidity forms. The precipitated globulin, after being uniformly mixed with the diluted serum, is poured into a graduated cylinder, the diameter of which is 1 in. On looking through the height of the fluid containing the precipitated globulin over some black spots fixed to the bottom of the cylinder and adding more and more of the fluid till the spots become just invisible, a point is reached which gives an estimate of the globulin precipitated.

An Epidemiological Study of 663 Cases of Kala-azar admitted to the Madras City Hospitals between 1913 and 1922 (J. Cunningham and P. S. Varadarajan).—A survey of 663 cases admitted to these hospitals has been made. This survey has been compared with a similar one made by Korke from cases admitted to the Madras hospitals between 1904 and 1911.

Both surveys show an identical area of maximum intensity in the neighbourhood of George Town surrounded by foci of infection arranged radially.

The available evidence tends to show that these foci, which were regarded at first as places to which kala-azar cases had migrated after infection, are themselves now foci of infection.

Cases have now been recorded in areas as far as

6 and 7 miles south of the city. The two observations would appear to indicate a slow and gradual extension of the disease since 1912.

The distribution of the disease with regard to sex, as far as Anglo-Indians are concerned, would appear to be about equal, males being slightly in excess.

Kala-azar in the Madras Presidency outside Madras City (J. Cunningham and P. S. Varadarajan).—There is no conclusive evidence of any other endemic focus of kala-azar in Southern India apart from Madras City. Cases of the disease may possibly have originated in Trichinopoly, Ponneri and possibly Pondicherry and Bangalore, but, so far as the evidence goes, they cannot be considered at present as definite endemic centres of the disease.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE, May 9, 1923.

Trachoma of the Rural Infantile Population of North Annam (E. Bouvier).—Trachoma is one of the most frequent of the many diseases prevalent in North Annam. The Hygienic Mission examined the eyes of all the children, up to the age of 15 years, in four cantons, and the results are as follows:—

Canton of Nam-Ban, comprised of fourteen villages, 41 per cent. were affected.

Canton of Trung-Ban, twenty-four villages, 40 per cent. affected.

Canton of Thuong-Ban, fourteen villages, 49 per cent.

Canton of Phi-Lai, six villages, 32 per cent.

Six cases of blindness were observed due to conjunctivitis of probable trachoma origin.

Periculous Anæmia of the Horse in Morocco. Persistence of the Virus of Cured Animals (Bigot).—Horses inoculated with the blood of animals considered cured three or four months previously showed a positive reaction 18-23 days after inoculation; none of the usual symptoms were observed, except a light yellow colour of the conjunctiva and a rising of the temperature; the reaction was short and not serious. The period of incubation is longer than when blood of a diseased subject is used; the average period is nine to sixteen days.

Trypanosomiasis of the Russian Camel (W. L. Yakimoff).—*Trypanosoma ninæ kohl-yakimov* was observed for the first time in camels of Astrakan, by Feinschmidt, 1912; Yakimoff, in 1913, found it in several parts of Russian Turkistan, and in 1914 Schonkewitsch found it in the Ural region. The Russian trypanosoma is identical with the Turkistan trypanosoma. Trypanosomiasis of the camel is a chronic disease, with progressive emaciation and hypertrophy of the lymphatic ganglia. In many cases where microscopic examination of the blood has been negative, the blood when inoculated into guinea-pigs has caused affection.

The following animals are infected with this parasite and the affection in each animal varies: horses, bovines, sheep, goats, pigs, dogs, rabbits, guinea-pigs, white mice, white and grey rats, geese.

For treatment, atoxyl, emetin and "Bayer 205" have proved the most effective.

Treatment of Recurrent Fever by Emetin (W. L. Yakimoff and Mde. A. S. Solowzoff).—Owing to difficulties in procuring salvarsan and neo-salvarsan the authors tried the use of intravenous injections of emetin for *Spirochæta obermeieri* but unfavourable results were obtained; 4 c.c. of emetin solution to 1 in 100 had no effect; progressive doses up to 18 c.c. seemed to give good results, but a few hours after inoculation, sometimes the following day, there was a relapse and the affection followed its ordinary course.

Castellani, during the epidemic in Macedonia and Corfu, 1916, found intravenous injections of emetin effective in preventing relapses, but its action was inferior to that of arsenobenzol.

Investigations on Flagellates of the Cabbage Bug (A. Laveran and G. Franchini).—The authors have found in the intestines of the red cabbage bug *Pentatoma ornatum* two species of flagellates—*Herpetomonas* and *Crithidia*. They are often very numerous and almost in pure culture. Intraperitoneal inoculations in young white mice cause a benign infection. A culture was obtained of round and oval parasites in N N N media with the heart blood of a mouse, but the elongated and flagellate forms did not evolve, and reinfections were negative.

A Case of Juxta-articular Nodosity observed in Morocco (P. Remlinger).—The patient was a Spaniard residing in Morocco, and always in contact with the natives. He complained of a slight pain in the elbows on movement, which was sometimes felt in the shoulder. In the left elbow just below the olecranon, a subcutaneous, hard, round, smooth nodule was found, the size of a chestnut, and in the right in the epitrochlear region an elongated, multilobular tumour resembling a date.

This is the first case of juxta-articular nodosity observed in a European, and may be attributed to the patient's contact with Arabs, or possibly hereditary, being an Andalusian and very dark skinned.

On the Presence of Hæmogregarinæ in Fish in France (G. Franchini and M. Saini).—Hæmogregarinæ are very rarely found in fresh-water fish, and have been observed for the first time by the authors in the digestive tube. Probably infection is by way of the alimentary track.

The hæmogregarina found in the blood of the gudgeon has been named *Hæmogregarina gobionis* n. sp., and that found in the digestive canal of the carp *H. carpinis* n. sp. *H. lacerani* is the name given to the parasite found in the tench, and *H. perche* to that of the perch.

A clear morphological description and illustration is given of the different forms.

The Action of Stovarsol on Lambliæ (E. Marchoux).—A child of 11 years affected with lambliæ was given a tablet of 0.25 of stovarsol daily for six days and was completely cured. After an interval of four weeks the treatment was repeated as a measure of prudence. Another patient was cured in ten days, but some cases have needed prolonged treatment.

Blastocystis (W. L. Yakimoff).—*Blastocystis* was first described by Brittain and Swayne, 1849, in their report on choleraic patients of the European epidemic, 1847-48. Swayne described it as a transparent flattened corpuscle of homogeneous content, surrounded by a more refringent wall and sometimes covered with protuberances. It has since been likened by other authorities to *Ascaris lumbricosis*, *Urocystis*, *Trichomonas*, *Chilomastrix*, *Valkkampia*, &c. *Blastocystis hominis* cannot be regarded as inoffensive, it sometimes causes intestinal troubles.

A New Trombidium, Schongastia salmi, n. sp. (G. Salmix).—A detailed description is given of this parasite, discovered in 1918. Its head is $450\ \mu$ long and $267\ \mu$ wide; its back is $60\ \mu$ long and $105\ \mu$ wide.

Results of a Hygienic Mission and of Antimalarial Prophylaxis in Thanh-Hoa, North Annam (E. Bouvier).—Malaria is very common in this country owing to the very bad hygienic conditions and bad habits of the people. Much has already been done by the Mission to improve conditions in the way of elementary instructions on hygiene, Jennerian vaccinations, drainage, &c., and distribution of quinine.

A Case of Plague Meningitis (M. Nogue).—A sharp-shooter, aged 40 years, entered hospital suffering from pneumonia and pericarditis. Examination of the sputum for Yersin bacilli and Koch bacilli was negative. He later complained of great pain in the lumbar region and Kernig's sign was very evident. Rare coccobacilli were found in cerebro-spinal fluid obtained by lumbar puncture; they were also found in serous matter from a ganglion of the groin which appeared quite normal. Towards the end of the month coma set in, with incessant meningitic crisis which proved fatal.

Bovine Tuberculosis in the Slaughter-house at Dakar (L. Teppaz).—The two cases of bovine tuberculosis of zebu, already described in previous numbers of this Bulletin, are commented upon by the author. In the first case the bacillus was of bovine type and caused reaction in the rabbit; the second case was a human type, but subcutaneous inoculations of emulsion taken from infected ganglia of the zebu had no effect on the rabbit.

Endemic Malarial Index at Ouagadougou in the Dry Season (M. Leger and E. Bedier).—Ouagadougou, the capital of Haute Volta (French East Africa), showed a malarial index, estimated in thin smears, of 46.6 per cent. in forty-five apparently healthy children, examined at the end of the month of March. The percentage of *Plasmodium praecox* was 66.6 and *P. malarix* 53.3; no *P. vivax* were observed.

Treatment of Malaria in the Valleys of Peru (E. Escomel).—During 20 years of observation and treatment of malarial patients the author has always found quinine in the form of comfits to give the best satisfaction. Diagnosis is effected by the method of "massive erythrolysis"; 1 to 3 cubic millimetres of blood is added to a centrifuge tube nearly full of

2 per cent. solution of glacial acetic acid; after centrifuging, the upper part of the liquid is removed, the sediment is washed with physiological serum and recentrifuged. The deposit contains the leucocytes and the hæmatozoa. The stain preferred for differential coloration is Gimard's Argentatorum.

Colouring and Morphological Variations of Giardia intestinalis (R. Deschiens).—The vegetative forms of *Giardia* are generally coloured greenish yellow with solution of iodine (iodio-chloric 1/50) and show a characteristic structure. Some cysts show glycolytic vacuolation staining mahogany colour. Cysts coloured blue with iodine are usually fractured.

The Acariform Embryo and the Larval Stages of Linguatulida (F. Noc).—The author has made a special study of linguatulida and in particular the embryo and larval forms of *Armillifer armillatus*. He describes the morphology and evolution of this parasite in detail, accompanied by clear illustrations.

Study of the Association of Amebiasis and Malaria (R. Tricoire).—These two diseases are very often prevalent in the same region and often co-exist in the same patient. They were found associated in 50 per cent. of the cases observed by the author at Taza, East Morocco. The symptoms of the two diseases combined are: marked anaemia, tachycardia, arterial hypotension, splenomegaly, hypertrophy of the liver and persistent intestinal troubles. The affection shows alternations of amelioration and relapse. Sometimes malaria is predominant and at other times amebiasis.

In treatment adrenalin should be used beside quinine and emetin. Strychnine and soda of cacodylate are also considered effective.

Medical News.

DR. ANDREW BALFOUR, C.B., C.M.G., F.R.C.P.E. for the past ten years Director-in-Chief of the Wellcome Bureau of Scientific Research, London, resigns that position on October 31, 1923. Subsequent to this date his address will be c/o Royal Society of Tropical Medicine and Hygiene, 11, Chandos Street, Cavendish Square, London, W.1.

He will be succeeded by Dr. C. M. Wenyon, C.M.G., C.B.E., M.B., B.Sc., who for the past nine years has been Director of Research in the Tropics at the Wellcome Bureau of Scientific Research, and has now been appointed Director-in-Chief of the institution.

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Original Communications.

MALARIA IN THE TRANSVAAL.

By H. A. SPENCER, M.R.C.S. Eng., L.R.C.P. Lond.
District Surgeon, Middelburg, Transvaal.

My appointment, as Government Medical Officer to this district for over twenty years, has afforded me exceptional opportunities for the study of malaria as it exists in this part of the world. The district comprises Highvelt, Middelveld and Lowvelt, where the disease occurs in chronic, subacute and acute forms every summer, and where it is epidemic every few years, whenever meteorological conditions recur which favour this form. A number of these epidemics have been carefully investigated and the protean forms of chronic malaria closely studied during this period. In order to get a clear idea of the source and prevalence of the mosquito and the various conditions favouring its existence at the different altitudes, a short description must be given of characteristics of the Highlands, Midlands and Lowlands, which vary considerably, yet indicate clearly that altitude alone offers no insuperable barrier to the existence and even prevalence of this disease, and that when malaria becomes epidemic in the Low country, provided that water is to be found there for the breeding of the mosquito, it will always be found in the same severe form at the highest altitudes in the country.

Nor is this astonishing when we read of the disease existing in precisely similar manner and form, as in this district, in the Himalayas at altitudes of 12,000 ft. above sea-level. In spite of which well-known facts it is still commonly believed that there is no malaria up on the Highvelt, little and of mild character on the Middelveld, but that the Lowvelt should be avoided during the summer months.

The altitude of the Highvelt in this district is about 6,000 ft. above sea-level. The Highlands may shortly be described as undulating, grass-covered country or prairie; it is swept by cool breezes and moderate to strong winds for nine out of the twelve months of the year, so that though the heat of summer is tempered, the cold of winter is intensified thereby and the winter months are very cold, ice being found upon all exposed water during nearly three months of the year, and as much as 16, and even 18, degrees of frost recorded during these months.

A characteristic of both the Highlands and Midlands is the existence of numerous vleis and pans, which we should call lakes and ponds, collections of water lying in circular and oval depressions in the surface of the country. They suggest extinct craters of volcanoes, but are probably merely subsidences. They are often of considerable extent, and sometimes occur at intervals over miles of the countryside. On the slopes around them may generally be seen the farm homesteads amongst a few eucalyptus trees, and although these expanses

of water are invariably very shallow, it is seldom that reeds grow in them or lush vegetation around their margins, which gives them a very bare and exposed appearance. Independent of the vleis, every homestead has its water supply a few yards away, consisting of a spring let into a small dam surrounded by willow trees.

The spruits and brooks of the Highlands are but small trickling streams, the origin of the larger streams coursing through the Midlands and of the more pretentious rivers of the Low country; they are few and far between and seldom flow the year round, but lie in disconnected pools throughout the dry winter months.

The Highlands descend plateau to plateau nearly 2,000 ft. to the Middelveld or Midlands, where the climate becomes less vigorous in winter but warmer in summer, the wind more tempered and less frequent, but where the same undulating grass country exists with the same vleis and pans, the same homesteads with private dams, and the brooks, now streams, forming here and there extensive marshes in their courses. In the midlands valleys begin to appear, often with sheer, precipitous sides, and becoming broader and deeper as they descend towards the Low country; each has its turbulent stream running continuously the year round.

The Midlands being better watered and forestry encouraged by every means, this part of the country is more wooded than the Highlands, where trees are scarce. This condition of things is increasing every year over the Midlands.

The Midlands again descend to the Lowvelt or Lowlands, or Bushveld as it is called, by similar plateaus, dropping through 2,000 ft. until it reaches an abrupt fall of from 800 to 500 ft. into the valleys of the Lowvelt; these valleys, lying between the sheltering escarpments and mountainous edges of the Middelveld, are from a few to many miles across, and continue to fall to the level of large rivers and to broaden out into river plains of considerable extent; they suggest, what is probably the physical explanation, that in ages past this part of the country was washed out by immense torrents fed by the (larger) rivers of the High and Middelvelds, excavating above and piling up river-plains below in their course to the sea. Rivers and streams course along the bottoms of these valleys still, running throughout the dry winter months as in summer, their courses being mapped out by thick bush and trees, which spread back into the surrounding country and up the ravines of the escarpments and mountains bordering the Bushveld; each ravine contributes its rushing torrent all summer, swelling the rivers rapidly to more pretentious proportions as the country descends.

This part of the country is sheltered, to stagnation in parts, and the summer heat tropical in intensity, geraniums, syringas and other flowers remaining in blossom the year round, and such tropical fruits as dates, bananas and papauas growing and fruiting well in the summer. When winter winds blow and daily frosts and ice obtain on the

Highlands and Midlands the climate is genial and spring-like over the Lowlands, the mean temperature falling below 60° in the highest parts during scarcely two months of the year, whilst in lower and still more sheltered parts of the Lowlands it probably seldom descends to this level, and malarial infections are possible and occur throughout the so-called winter months. The winds of the higher country do not reach this level.

From the streams and rivers here, miles of irrigation furrows and canals are led into the bordering country wherever cultivation is in progress, past the front doors of dwellings, through the playgrounds of schools—all amongst the dwellings and anywhere where they will run, in addition to which each dwelling has the usual spring, dammed for household purposes, close to the house.

THE SEASONS AND RAINFALL.

This district is strictly inland in its climate, the atmospheric pressure being lowest during the summer months, from September to March, which is the rainy season, and highest during the winter months, March to August, the dry season, when little if any rain at all falls. Roughly, then, the summer is the wet season, and the winters are dry; but the amount of rain falling over Highvelt, Middelvelt and Lowvelt varies but little, and averages from 30 to 32 in. each summer. Generally speaking, from 4 to 6 in. of rain falls over this district each month during the season, the intervals between falls being seldom more than three or four days. In early summer, when thunderstorms obtain and occur almost daily in the afternoon, the storms are so local that a fall of 4 in. (even of 6 in.) may occur over a very limited area, whilst none may fall within sight of the storm nearby.

PREVALENCE OF MALARIA IN RELATION TO RAINFALL.

On the Lowlands winter comes to a very abrupt termination, and within a couple of weeks almost summer heat prevails, whilst the mean temperature rises and maintains a higher level, and though no rain has fallen for a few months, malaria makes its appearance sporadically throughout the Lowvelt. Mosquitoes, which have been hibernating in the thatched roofs and warm corners of the dwellings, at once make their appearance, and their eggs may be seen upon the surface of the river pools, water furrows and dams.

If the rains hold off and are later than usual, malaria rapidly becomes more general and may become very prevalent before the rains begin to fall heavily and regularly, but within a week of this occurrence, the onset of the rains, a steady decrease in malaria is invariably noticeable, and during summers of exceptionally heavy rainfall there will be practically no malaria at all throughout the Lowvelt whilst it lasts. These early infections are invariably benign tertian, the severer cases being, no doubt, due to multiple infection and saturation.

As the summer wanes and the autumn begins the rainfall begins to fall off, and malaria again makes

its appearance; and there being now abundance of water everywhere, lying in pools in every depression of the ground as well as other sources, infections increase in numbers and in severity almost daily.

But the mean temperature at this time of the year is as high as at any time during the summer months, reaching 72° F., and even 75° F., and diminishes but slowly during the succeeding weeks. It is at this time of the year that malignant infections and remittent fever make their appearance, sometimes assuming epidemic proportions before the sudden falling of the temperature ushers in the "winter," cuts short further infections, and causes a rapid subsidence of the disease. Examination of many blood smears during these autumn infections reveals not only benign tertian, but the co-existence of malignant parasites also, the time of appearance of the latter parasites suggesting that they require a higher mean temperature to develop than do the former.

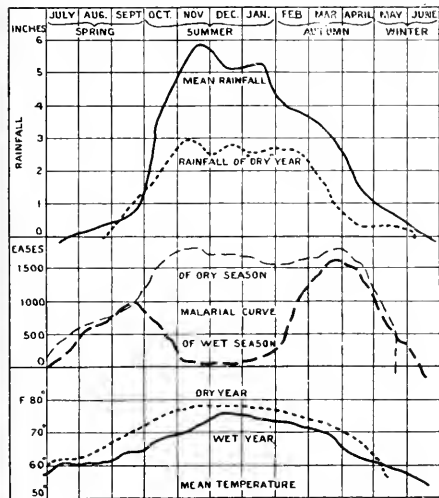
The sequence of events described has been invariable and marked as the usual conditions for many years, viz., sporadic to very prevalent malaria from the cessation of winter to the onset of the summer rains about three months later; sporadic malaria only during the rainy months increase of malarial incidence again with the diminution of the rainfall in autumn, with malignant infections added to the benign tertian; and if the autumn conditions are prolonged, malaria is epidemic until the fall of the mean temperature below 60° F.

Every few years, however, varying from three to five, the meteorological conditions described vary from the usual; sometimes excessive rainfalls occur throughout the rainy season, when the usual diminution of malaria during this time is accentuated to an almost total absence of the affection anywhere; but sometimes the rainfall throughout the summer months falls far below the average, the amount of rain being far less and the intervals between the showers much prolonged, and it is during these "dry" summers that epidemic malaria of an unusually severe type occurs, beginning at the time of arrival of the usual rainfall, and continuing with ever-increasing incidence and intensity throughout the summer and autumn months, until brought to an abrupt termination by the arrival, with only a few days' warning, of cold nights.

The accompanying diagram has been compiled to illustrate the fall of malarial incidence, which usually takes place during the regular rainfall; the rain and mean temperature curves, compiled from daily observations taken here, represent the means for twenty years. The dotted lines represent the altered conditions which obtain during "dry" summers when the rainfall is deficient. The malarial curve may be taken to read in hundreds for each square.

It is frequently remarked by writers upon malaria that the incidence is markedly increased during the rainy season, exactly the reverse of what takes

place over S. Africa. This may be due to insufficient rainfall to effect the necessary flushing of the pools or to the intervals between rainfall being sufficiently prolonged to enable the eggs laid upon the pool, &c., to develop into mosquitoes. In the Colonial Medical Report for Ceylon for the year 1921, however, published in the JOURNAL of TROPICAL MEDICINE AND HYGIENE on March 15 last,



Relation of Malarial Curve to Rainfall and to Mean Temperature in Wet and Dry Summers.

I see that the Principal Civil Medical Officer was struck by the same conditions as obtain here—that where the rainfall was “normal” (evidently high) or above the average, a decrease in the number of cases of malaria admitted to hospital was noticed, whereas in the provinces, where the rainfall was deficient, this deficient rainfall was “evidently favourable to the multiplication of the malarial mosquito.”

EXPLANATION OF DECREASED INCIDENCE OF MALARIA DURING THE PREVALENCE OF REGULAR RAINFALL.

On the Lowveld here, as soon as the temperature conditions are suitable and before the rains set in, mosquito eggs may be seen in myriads upon every collection of exposed water; the water in the dams beside the houses, in the irrigation furrows, and in the river pools is at this time of crystal clearness, and mosquito larvæ may be seen everywhere. In consequence mosquitoes soon become pestilential in every house and malaria prevails. As soon, however, as the rains set in all these collections are thoroughly flushed by every thunderstorm that falls, converting the furrows, streams and rivers, for some hours at least, into rushing torrents. Moreover, the surface of the ground, which had

previously been baked in the sun during the preceding three to five months, and which contains much oxide of iron, is washed into these furrows, streams and dams, converting the water into a solution of reddish mud, a condition incompatible with the existence of mosquito larvæ so long as it is in this state—and it may remain more or less in this condition throughout the summer whilst the rains last. But the force of the rushing water is sufficient to carry the eggs and larvæ of mosquitoes many miles away in a very few hours; those arriving from higher up are likewise carried on by the rushing water. Only in a few sheltered collections of water could mosquitoes breed during these summer months, but the houses already harbour myriads of mosquitoes bred before the rains arrived. I once had very eloquent testimony of the many thousands of mosquitoes which a house can harbour.

A very severe epidemic of malaria had recently swept through a Labour Settlement in the Lowveld of this district, and very cold nights had suddenly set in, bringing it to an end; early one morning I visited a thatched cottage where man, wife and three children were lying seriously ill with the disease, and on entering was astonished to see a thick layer of dead mosquitoes lying upon the table, chairs and floor, which had fallen out of the thatch, killed by the sudden cold. Anophelines, Culex and Stegomyia were easily recognized in hundreds of thousands.

IMMUNITY IN MALARIA.

So many writers are silent upon this question—others stating that there is no immunity in malaria—that for some years, accustomed to see the same people suffering from the disease year after year with no apparent diminution in severity, I shared the same belief. But ten years ago C. W. Daniels stated that “in malaria immunity is slowly acquired by repeated infections,” and with this dictum and a further knowledge of the effect of toxins upon the tissues, I think all careful observers must agree. In a disease associated with the production of so irritating a toxin, and in such quantity as occurs with every brooding of parasites, it is in accordance with the behaviour of the tissues that they should react to it less and less as infection follows infection, producing an ever-increasing tolerance to the irritation with a disappearance of, perhaps not all, but many of the symptoms of malaria.

Thus in *acquired immunity* there can be no doubt that the acuteness of the disease is lessened as time goes on, and the more severe symptoms disappear, giving place to chronic malaria with exacerbations due to occasional saturation with parasites. It accounts for many old and weak people surviving, time and again, saturations which are constantly fatal to younger people who have not yet developed any immunity. This is most noticeable during epidemics—how old people with all manner of defects and weaknesses will survive the most acute attacks, whilst many of those in the very heyday of youth succumb to less severe infections. And

it is upon the Highlands and Midlands where benign tertian infections of a mild type prevail almost entirely, that chronic malaria is so prevalent, whilst down upon the Lowlands, where saturations with benign tertian parasites are of seasonal occurrence, with now and again a malignant infection, that hundreds of young and apparently robust people die of the disease annually, the survivors of past saturations and epidemics escaping with their lives year after year. It is really most striking and due to the slowness of development of the protecting tolerance. I believe also that, in consequence of this slowness of development, man's life is not long enough to acquire a complete immunity from attacks.

Congenital immunity is, in my experience, a certainty, and due to precisely the same conditions, a slow acquisition of tolerance during uterine existence resulting from repeated infections, mostly mild, in the mother. I see no reasonable difficulty to the young parasites, immediately after a brooding, gaining admission to the blood of the fœtus through the placental epithelium any more than exists when sporozoites gain admission, when wiped off a mosquito's proboscis in a sebaceous or sweat duct, through the lining epithelium of the duct into the blood-stream. The toxin liberated in the mother's blood will most easily find its way into that of the fœtus and affect its tissues. This inherited immunity, I believe, alone saves the lives of the children so often seen severely affected with acute malaria, yet recovering without treatment; and again enabling them to run about, apparently quite healthy and normal, with parasites in their blood and enlargements of the spleen which are visible.

Children in the Transvaal are largely, if not mostly, affected with the various evidences of chronic malaria—e.g., bronchial catarrh and "summer cough"—developed from congenitally acquired immunity. These children rarely suffer from an explosive attack of malaria, but only from "feverishness," which vanishes without treatment, other than early bed, or from periodical headaches.

The immunity described is merely a protection against more severe symptoms afforded by the tissues, not against infection with the disease by mosquitoes. Yet I have had many examples of this latter protection, which there is no gainsaying.

Natural Immunity.—During some years I have met a man here and there who I was satisfied had never been affected with malaria; even if they have forgotten or not known of any infection which occurred in infancy or in early childhood, a few attacks, however severe, do not give complete immunity for life. A similar complete immunity has been met with, less frequently, amongst women whose husbands, beside them, have been infected time and again; for many years these wives have shared every exposure to infection to which their husbands were constantly subjected with the usual result of periodical attacks of malaria, yet they have escaped infection themselves.

Such cases of natural immunity—men and women—always volunteer the information that they are not bitten by mosquitoes, and that, whilst those about them, wives or husbands, are always bitten by any mosquito that is about, they are never bitten to their knowledge.

After the recent campaign in East Africa I met quite a number of returned soldiers who were possessed of the same natural immunity against malaria; these men shared every hardship with the rest, they suffered from exhaustion and starvation with them, became chilled sleeping in clothes wet through night after night, and were reduced and exposed to infection just as often as the hundreds of men about them, most of whom developed severe attacks of malaria at every halt, and were packed off back to hospitals, where they had comfortable beds, skilled attention, and all the food they required until their recovery. These immunes have told me how they cursed their luck on many occasions at such invidious reservations, and would most willingly have parted with the protection which rendered them insusceptible had they been able to do so just to secure a little rest and good food for a time; but these men continued to be exposed to infection year after year as the campaign wore on and still remained free, finally returning to the Union in good health after three years' service, when it was all over. They were then sent to a hospital, and remained there whilst successive smears of their blood were examined periodically, but no parasites or even pigment was ever found in them. Like those previously met, these men all told me that they never to their knowledge were bitten by a mosquito.

These immunes are not marked off by any special characteristics; they were all ordinary healthy, well-nourished people with invariably medium-coloured brown hair—I have never yet met any quite dark or light-complexioned people, with dark or light hair, showing any natural immunity—nor did their skins, examined carefully, show any apparent difference in coarseness or the reverse to those without immunity; yet the facts point strongly to their secretions possessing some property which is repellant to mosquitoes—anophelines and others—which is not subject to variations under any altering conditions, and to this must be ascribed their protection. I have suggested to some of these immunes that I should be allowed to inoculate them with a small quantity of malarial blood to see if they were actually immune to the disease—which I cannot believe—but so far have been rather discouraged, even rebuffed.

BENIGN TERTIAN INFECTIONS ON THE LOWVELT.

Here practically everyone possesses more or less congenital and acquired immunity to the disease, so that those who suffer from malaria are saturated, or nearly so, before symptoms appear.

The first symptom is tiredness of body with aching legs, generally referred to as aching all over; then comes restlessness, headache and pain, stiffness or aching of the back of the neck from the

occiput to the shoulders. This symptom (neck-ache) is, in my experience, pathognomonic of malaria, and associated with no other illness or ailment known to me. In the next twenty-four hours the temperature quickly rises to 104° or 105° F., and all other symptoms become accentuated; at this time a severe pain in the small of the back is felt, whether from irritation of the spinal cord by the toxin or due to irritation of the kidneys by the concentrated urine. I am inclined to think that both causes are acting, for swelling with hot drinks, though it gives some relief soon, does not remove it entirely, and now and then cases are seen entirely unrelieved by drinking much fluid. Thus is a patient seen, when first affected, for some five to eight days, the temperature being continuous, with dips of not more than one or two degrees during this time owing to overlapping of multiple infections—invariably so. A rigor and heavy sweat may then be followed by a drop of the temperature to normal, or nearly so, and remain at this, or, at any rate, a lower level for an interval of a few days or of ten days or more before a recurrence of all symptoms again takes place. Many patients go through attack after attack without having a rigor at all, some begin with it, but classic symptoms are seldom seen owing to interference by immunity and by the overlapping of infections. Periodicity and regularity are also unrecognizable owing to the same qualifying agencies, but it is also often delayed—a recurrence—by a few tabloids of quinine having been taken now and then and giving some assistance in the destruction of parasites.

The conditions described may continue at intervals all through the summer and autumn, the sufferer living all these months upon the shady side of the house, on the veranda, overcome with lassitude, exhausted by every exertion, his brain numbed, and his sight dimmed by cerebral and ocular anæmia. This anæmia may not be apparent in their sunburnt, rubicund faces, but they are unable to keep their eyes open in strong light, so sit blinking, in smoked glasses if obtainable, cudgelling their brains in their efforts to think clearly and trying to express themselves coherently and connectedly. Once they get under way they talk very fast, lest the word wanted elude them ere it is spoken; trivialities rouse them to wrath; they sleep as they sit or on attempting to read, and optimism rules over all—they will completely recover in a few days. Result: year after year rolls by, and things upon the farm pretty much take their own course, their cheeriest optimism never leaves them, yet they never "make good," they never read for fear of falling asleep at once, and they never inquire for treatment, because "we know that malaria has always been here, and we believe that it always will be; the only thing is to get used to it."

This is what is everywhere known and recognized as malaria upon the Lowlands—just the natural result of many times repeated infections with benign tertian parasites uninterfered with by treatment, or to a very small extent.

The cerebral condition appears to be caused by infection of the arterial endothelium with parasites and by irritation of the nervous system by the constantly released toxin, the anæmia by definite destruction of red corpuscles by the parasites unchecked by any treatment. On several occasions thrombosis in cerebral vessels with its concomitant symptoms and sequelæ has been witnessed during the malarial "season."

In summers of little and infrequent rainfall, when malaria becomes epidemic, benign tertian infections alone occur for some weeks and become more and more severe; and then the malignant infections are added, "bilious remittent fever" and a rapidly fatal "fever" with abdominal pain and thoracic oppression appears, and the disease known as malaria passes from their ken—although it recurs every few years it is not malaria, it is no disease that they know—so different is it from benign tertian infection.

SUBTERTIAN AND EPIDEMIC MALARIA ON THE LOWVELT.

A few cases of this infection occur sporadically over the Lowvelt most years—in the autumn—as the rainfall begins to decline and whilst the summer heat is still maintained, the mean temperature still standing well above 70° F. It usually happens, however, that these meteorological conditions are brought to an abrupt termination by the sudden advent of quite cold nights and a corresponding fall of the mean temperature to below 60° F. in the course of six or eight days, when fresh infections cease and "the sickness" is reported to be at an end. But if these conditions are prolonged for some weeks, and this sudden change to winter is unduly postponed, as sometimes happens, this serious infection tends to become rapidly epidemic, and in every respect simulates the "aëstivo-autumnal fever" of the Italians. As it often "yellows" those affected, proves fatal with alarming suddenness, and by the rapid rise of the endemic index appears to be communicable from one to another, it is not associated with malaria in the minds of the inhabitants, and causes much alarm by the way in which it differs from the "ordinary malaria" known to them; and this in spite of the fact that it has occurred in epidemics at irregular intervals in these parts during very many years, has caused the death of large numbers of both Europeans and natives each time, and by appearing, and rapidly spreading, amongst large gangs engaged upon public works in these parts has temporarily stopped all work. It has been variously labelled typhoid fever, typhomalaria, and even typhus fever on these occasions, and it is recounted that whilst the death-rate amongst both Europeans and natives in these gangs was appallingly high, those who recovered sufficiently to reach their kraals many miles away, wherever they arrived, conveyed the same sickness to the people in these kraals.

For it happens every few years—three, five, or eight years—that the regular rainfall fails, rain

falling in diminished quantity and at prolonged intervals in insufficient quantity to flush breeding pools of their mosquitoes; then the usual benign tertian infections early give place to subtertian, this infection obtaining and becoming epidemic throughout the summer as well as the autumn months all over the Lowveld, and spreading up on to the Middelveld and Highveld.

Though benign tertian infections still occur here and there during these epidemics, this infection never predominates, probably on account of the varying amount of immunity to it established amongst all residents. Examination of many blood smears during these epidemics demonstrated benign tertian with small parasites at first, but as the endemic index rises the small forms only, with much pigment, were to be seen, one report stating that they appeared to be *Plasmodium falciparum*.

The following are the usual symptoms and conditions seen during these epidemics:—

Within a few hours of feeling well headache and general soreness and aching of body and limbs set in, there is giddiness, some fever, and frequently epistaxis and vomiting, which appear to give some relief to symptoms. Rigors are not common, but chilliness is pretty general. The temperature soon runs up to 103° or 104° F., even higher in some cases, and this continues day after day with some remissions of a few degrees only and no intermission.

There are three features, characteristic of this infection, which are seen in every case more or less pronounced, but which do not belong to the "ordinary infection."

(1) A yellowing of the skin of face and body appears early almost with the first symptoms of malaise, and increases daily. It has the appearance of ordinary jaundice, and probably is caused by circulation of bile in the blood, due to a catarrhal condition of the liver and bile ducts caused by the irritation of the toxin being excreted from the blood by every possible means and path. It causes catarrh and secretion of mucus in the stomach and intestines, and may be smelt in the vomited material quite early; there can be no doubt that the toxin of this infection is very irritating to all mucous membranes upon which it is excreted—stomach, intestines, lungs, bladder and the endothelial lining of the heart—and is responsible for most of the special symptoms. The jaundice soon fades when the toxin is eliminated and assistance given to this end, and is practically unobservable in the few cases which begin with a free mucous diarrhoea.

(2) Shortly after the onset of the fever aching and discomfort are experienced in the abdomen; this occurs at the site of the various flexures, caecum, hepatic, splenic and sigmoid, but principally at the two upper flexures—at the spots where stasis of the intestinal contents naturally takes place. It is worse in those who are constipated when they become affected, and is not present in those who begin with diarrhoea or who

induce it. It is at once relieved by mild and repeated purgation, and it is this symptom which confuses this malarial infection with typhoid fever, for if relief is not afforded early diarrhoea is induced by the irritation of the toxin excreted into the intestine, and is followed by relief to all symptoms. An alkaline aperient, such as sulphate of soda or magnesia, gives more rapid and complete relief than castor oil or even calomel.

(3) An early symptom and very characteristic of this infection is the vague discomfort and "ache" experienced over the precordium, and due, I believe, to the irritation of the toxin circulating in the blood. It is accompanied by restlessness and much sighing as in a severe haemorrhage; the heart beat intermits, and at first is inclined to be tumultuous, though this in about twenty-four hours quiets down to a soft first sound, which is a definite danger signal. It is at this time that a fatty or neurotic heart, a senile or an infantile heart, may cease action with alarming suddenness. I consider, from the invariable diffusion of the apex beat, that the pericardial fluid is increased to a definite extent, but no bruit or rub is to be heard at this or at any later time. I do not consider that the amount of pericardial fluid offers any obstruction to the pulsating heart or assists in any way to bring about a cessation of its action, it is never in sufficient quantity to produce this; the cessation of the heart beat appears to be caused by a poisoning of the ganglia and nerves in its muscle by the toxin. A quickening and deepening of the respirations, without sufficient cause for it in the lungs, is another definite danger signal of impending collapse of the heart. I never visited these epidemics without being provided with a good supply of strychnine and digitalis made up to teaspoonful doses with tincture of oranges, 5 minims of each, and have no doubt that this saved many scores of lives by keeping the heart going whilst the quinine administered was being absorbed. Without it lives have dropped before the quinine taken could be utilized almost whilst I turned my back. This characteristic symptom also is soon relieved by every means taken to assist the elimination of the toxin and to diminish further formation of it.

The pain or acute ache in the back, though not a constant symptom, is a very distressing one, and very severe in some cases. It occurs in the lumbar region, and frequently radiates down the course of the sciatic nerves to the feet. Minor degrees of this symptom are relieved by swilling the patient with fluids and thus washing out the kidneys, irritated by the urine and contained toxin, but in the more severe cases there is evidently an irritation of the meninges of the spinal cord to be dealt with, if not of the cord itself, relieved as the quinine is absorbed and the parasites killed.

In these cases a definite girdle pain has many times been described, the knee-jerks being found to be diminished and even absent with incoordination of the leg movements and typical ataxic

symptoms. They occur amongst a large class of neurotics, who seek the Lowvelt for the sake of the more congenial heat, but all symptoms ultimately subside under quinine, which has been unavailable or neglected by these cases usually.

It is in such cases that acute photophobia occurs, no doubt due to prolonged blood destruction by the rapidly brooding parasites and anaemia of the fundus oculi. Organic arsenic in these cases produces the most rapid improvement and relief.

Not uncommon in these epidemics are cases which appear to be profoundly saturated with infection, the parasites invading the bone marrow of almost every long bone and producing acute rheumatic pains in the limbs and joints; these latter appear affected above and below the actual joint, which is not distended with synovial fluid, though containing more than normal; but these joints are so painful upon the slightest movement that the case appears one of acute rheumatism. I have had these cases, in ex-soldiers, sent to me with this diagnosis on several occasions, the marked enlargement of the spleen and anaemia suggesting first the treatment with quinine, which soon gave relief. They had all been treated with salicylates for some time.

A condition of acute bronchial catarrh is fairly common amongst children particularly as a result of toxin irritation excreted into the air cells and bronchioles. Both lungs are affected in their entirety, and if not quickly relieved may rapidly cause asphyxia. By auscultation it gives the impression of an acute pulmonary oedema, and like that condition is attended by a constant and ineffectual cough, with scanty expectoration of frothy, clear fluid in which the toxin can readily be detected by the smell. It is frequently diagnosed as pneumonia, and treated as such with fatal results, whilst a few doses of quinine give speedy relief, and a continuance of this treatment causes the absorption of all the fluid as quickly as it was secreted. The disappearance of the trouble, in a child gasping for breath and already cyanosed under regularly administered doses of euquinine, savours of the miraculous.

Amongst children and adults—numbers of cases occurred amongst the soldiers returned from East Africa—puffiness of the eyes and oedema of hands and feet point to affection of the kidneys, and albumin is invariably present in the urine of such cases. Extremely little pulmonary oedema is induced in these cases of nephritis, nor is the condition a contra-indication to the administration of organic arsenic intravenously, against which a warning is published generally.

The routine injection of arsenic was invariably given to these soldiers with rapid relief and no ill-effects. With children, however, the condition is frequently fatal, though I am inclined to think because of the difficulty of administering quinine regularly.

The subtertian infection in women is far more fatal than in men; menorrhagia and metrorrhagia

are readily induced by a severe infection, and though curable by the persistent use of quinine, may be stubborn and quickly reduce the patient's strength, seriously affecting the weak and fatty hearts which predominate amongst them.

Then in the case of pregnancy, the mother who refuses or cannot get quinine will invariably abort or give birth to her child prematurely under this affection, the child being killed by the disease beyond any doubt. In such cases the children are stillborn and always deeply bile-stained; in a good many cases where the mothers had weathered an attack with the help of a very few doses of quinine they carried dead children for from two to three weeks *in utero*, and whilst walking about suddenly gave birth to bile-stained children with the epidermis peeling from their bodies; the children had died from the infection before any quinine reached the mothers.

On the other hand, I have treated numbers of mothers who were pregnant with 5-gr. doses of quinine four-hourly, who have, without an exception, recovered, gone to the full time, and given birth to perfectly healthy children, though some of these had enlarged spleens. I have given organic arsenic intramuscularly in these cases with undoubted benefit and a speeding up of their recovery from the infection.

The anaemia occurring in this infection is most marked where treatment has been delayed or neglected; for it is an unfortunate fact that the low intelligence of many living in these unhealthy parts leads them to prefer the disease to symptoms of quinism, and though abundance of quinine may be at hand to wilfully neglect treatment.

Amongst natives this infection is less severe than amongst Europeans, their congenital and acquired immunity is more marked, and modifies their symptoms. Their hearts suffer to a less degree, but the yellow conjunctiva is constant and anaemia most marked, their gums becoming as white as their teeth, and producing a ghastly appearance when they smile. Absence of treatment amongst them also leads to constant recurrences all winter of a severe nature, often killing off the young and old. They think nothing of "ordinary malaria" (benign tertian), but are dazed and stupefied by the subtertian infection, which they do not yet understand. Much might be said of the further protection afforded by their custom of having their fires in the middle of the floor of their huts, their soot-begrimed thatched roofs which preclude the harbouring of mosquitoes, and their habit of covering their heads with their blankets when they sleep. But when the nights become warm the men invariably sleep on the verandas surrounding their huts, and no doubt there become infected, whilst those within escape.

To what are the symptoms of malaria due?

The parasites may live in the red corpuscle without symptoms of any sort—until they brood. One or two isolated infections may brood a good many times without producing the explosion of ague,

fever, body and head ache, known as an attack of malaria, some of the young parasites never reaching a red corpuscle owing to the intercession of and their arrest by a police cell (leucocyte), the remainder continuing to grow and to brood without interfering with the health, but producing at their broodings what is now known as chronic malaria, with its bronchial catarrhs, its chronic rheumatisms in the bones, and its periodical headaches, slowly producing an acquired immunity the while. But if these few infections become suddenly increased to some degree of saturation, then, at the next brooding of the large number of parasites, a recognized attack of malaria is produced, and if the parasites are not diminished by treatment, recurrences of the attack with each successive brooding.

In the first place, therefore, it is the toxin, set free by the brooding parasites, that produces the recognized symptoms of malaria, a poison so irritating to the tissues that violent reaction is at once set up, continued until at least most of it is eliminated by one means or another, and repeated again and again with each brooding.

I think there can be no doubt but that the irritation of the toxin produces the aching of the muscles of the body and limbs, the meningeal congestion with the head and backache, the fever, the rigor and the profuse perspiration which follow its production and eliminates so much of the toxin in the blood. But I also think that the toxin is eliminated not only by the skin, but also by the mucous lining of the body and lungs, producing an irritation catarrh, the secretion from which dilutes it and makes it less irritating.

The toxin is easily recognized by its offensive smell, somewhat resembling rotting damp straw, so that a case of malaria may be detected at once upon entering a room where such a patient has been lying, or is lying, sweating. It may also be detected in the expectoration of a case of bronchial catarrh, and it has been detected in the vomit and in the diarrhoea resulting from a malarial gastric and intestinal catarrh, even when removed away from the patient to another room, suggesting that the vomit and faecal matter must contain a considerable amount of toxin; no doubt a poison so irritating as to produce catarrh of the lining of the air cells and bronchioles also produced an identical catarrh of the gastric and intestinal mucous membrane, which may extend along the bile duct to the gall-bladder and liver, or produce a catarrh of the bile ducts throughout the liver, either way producing the bile staining of the skin in subtertian infections, and giving rise to the abdominal symptoms which accompany the bile staining. It is not irrational either to consider that the heart symptoms seen in this infection are produced by irritation of the endothelial lining and of the ganglia in the walls of the heart by the toxin. It is a fact that the vomiting and diarrhoea of malaria do give the same relief to symptoms as does profuse perspiration.

There are, however, other symptoms which are

produced by stasis, observable in infected corpuscles in the circulation, and in saturations with infection this stasis no doubt is responsible for the congestions and even blockings in the vascular system which cause the hæmorrhages which occur from intestine and uterus particularly, but also from the nose, and for the cerebral thrombosis which is occasionally seen. Epistaxis does sometimes occur, indeed generally does, during fever, but in the many cases of hæmorrhage which I have seen, and in the few cases of cerebral thrombosis, all have occurred during quiescent periods when symptoms of active disease had passed off—in fact, between the broodings of the parasite, as shown by absence of fever and other symptoms of toxin poisoning.

TREATMENT OF ACUTE MALARIA.

In my experience it is scarcely necessary to differentiate between the treatment of the two types of malaria under discussion, but it is noticeable that their response to treatment differs markedly, subtertian malaria responding much more rapidly and apparently to smaller doses of quinine than does the benign tertian type; but recurrences, even after prolonged treatment, are the rule and characteristic of subtertian infections. As suggested by various authorities, it is probable that the smaller parasites of subtertian infections are carried and deposited in many out of the way parts of the body, where they remain—for quinine appears to reach such places with difficulty—for long periods, their broods overflowing into the circulation at intervals, whilst some always remain behind. The ordinary dose of gr. v of quinine, however, will relieve symptoms in subtertian infections in twenty-four hours, whilst the same dose takes from two to four days to bring about the same relief in benign tertian, though the latter will be more lasting.

One's treatment aims at killing the parasites off, assisting the natural elimination of the toxin, neutralizing what may be left in the tissues, and mending the damage done by the parasites and toxin after the former has been achieved.

(1) Killing off the parasites and thus preventing the further generation of toxins is still best effected with quinine, though I consider that organic arsenic runs it very close, and a combination of the two to effect this result the most quickly and effectively.

To men who will put up with the resulting tinnitus and partial deafness, I find that gr. x of quinine thrice daily will usually remove all discomfort and bring the temperature down to normal in about forty-eight hours in a benign tertian infection, and in less time in a subtertian infection, a continuation of this dose twice a day for another four days appearing to clear nearly all benign tertian infections of that particular dose of malaria. For I may say at once that in this infection I look upon—and investigation of very many cases confirms me—recurrences after this much treatment as reinfections. I have so many times seen cases

After this treatment go under mosquito nets every summer, and remain free from any suspicion of a recurrence for, in one case, fourteen years, reports upon blood smears giving further confirmation. As regards permanent deafness, after this dose, even given for four or five days, I have never yet seen it.

To women I invariably give half this dose four-hourly, and find it borne well under all conditions, even of pregnancy and in subtertian infections; children born after this treatment have been so at full time, and appeared healthy in every case where I was sure that any little tinnitus had not led to neglect of treatment or to prolonging the interval between doses. But this dose takes almost exactly twice as long to produce the same relief to all symptoms as a full dose does. I take the precaution to reduce the number of doses daily to thrice a day as soon as symptoms are relieved in all cases of pregnancy, and I am convinced that this dose never produced premature birth of a child at any stage of pregnancy.

As regards the use of organic arsenic in the treatment of malaria, I feel confident, as a result of nearly ten years' experience of its use in this disease, that it is fatal to this parasite as it is to most—if not all—the protozoa. It appears, however, to be too quickly eliminated when given intravenously, and to have been mostly given in unnecessarily large doses by this method perhaps in consequence of its rapid elimination. Given intramuscularly every four days, the results, in conjunction with quinine by mouth, are excellent, and hasten the clearance of the patient considerably. It is rarely necessary to give it more than three or four times, and usually patients disappear, considering themselves quite cured after the second. It is my custom, as soon as acute symptoms subside under a larger dose of quinine, to drop the dose to gr. v after each meal and a fourth at bedtime along with the arsenic injection, but many patients who are anxious to return to their duties as soon as they feel able to only find it necessary to take gr. x at bedtime each night and an intramuscular injection every four days to completely clear themselves.

I only use two preparations of arsenic for intramuscular injection, each in doses of gr. iii, a smaller dose appearing to be of little avail. Soamin or sodylate of soda are the preparations I use, and the injection is given into the triceps at the back of the left arm, making it bulge by grasping the arm from the front and pressing the fingers together until protrude a mass of muscle in which the needle can be buried without coming nearer the musculo-spiral nerve than three or more inches; the dose is given sufficiently diluted there is not the slightest discomfort when slowly injected, and the needle is smartly and suddenly withdrawn where there should be no solution left along its track to cause any smarting.

The intramuscular injection of any preparation whatever of arseno-benzine I consider absolutely human; although the neo-kharsivan and neo-

salvarsan preparations are widely advertised as fit for intramuscular injection, I have seen nothing but the most acute suffering for many days result, and often sloughing and very slowly healing ulceration. I use both largely for various conditions, but only intravenously.

(2) The elimination of the malarial toxin.

Whilst proceeding with the destruction of the parasite much and quick relief may be given by assisting the elimination of toxin from the system.

(a) Sweating should be encouraged by swilling the patient with hot drinks, such as weak tea or coffee, or even hot water alone. A dose or two of aspirin is most useful for this purpose. In this way diaphoresis and diuresis are both encouraged, the kidneys and urinary system being washed clear of the irritating toxin.

(b) Assisting the evacuation of the intestinal tract by giving repeated dram doses of sod. sulph. or mag. sulph., and thus obviating the discomfort and irritation of the toxin passing slowly, with many stops, along the intestines. Emetics are still sometimes given and act by evacuating the stomach of toxin; no doubt this would relieve the intestines of much additional irritation.

Amongst many dwellers upon the Lowvelt a dram of sulphate of magnesia on alternate mornings is looked upon as a preventive of malaria during the summer months, having gained ground from the fact that those who follow this course do resist attacks for longer than those who do not; no doubt it acts by constantly removing toxin and preventing its accumulation in the intestines, but in my experience their time comes later on as they fill up with the parasites, though they always appear to me to suffer less and to recover more quickly under a few gr. x doses of quinine.

(3) The neutralization of the toxin in the tissues, in the intestines, and in the urinary system by alkalinizing the patient before starting quinine treatment—as suggested by Major J. A. Sinton in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for April 2, 1923—offers the best combination of all these methods as yet put forward, and will doubtless be followed with success by large numbers of practitioners in future. In the few cases in which I have followed this treatment it has been highly satisfactory. The alkali, given in two-thirds of a tumbler of water as I give it, does appear to definitely neutralize the toxin in a short time, so that before the quinine treatment is begun the patient is already relieved. I look upon this treatment as a definite advance.

In conclusion, I would like to sound a warning note in connection with the confusion at present existing between recurrence and reinfection; where the possibility of the latter is put out of court, in every case I find benign tertian quickly curable by the ordinary means of treatment described and without suspicion of "recurrence," and I am convinced that most of the recurrences described in this infection, after ordinary treatment, are reinfections. At any rate, let the latter be put out of court before recurrences are talked about.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 1, 1923.

MINISTRY OF HEALTH,
Whitehall, London, S.W.1.

August 14, 1923.

CANCER.

SIR,—

(1) I am directed by the Minister of Health to state that he has thought it well to have prepared a short

memorandum on cancer for the guidance of local authorities, in view of the great and increasing amount of suffering and death due to that disease in this country, the public concern which is evinced by its prevalence, the failure so far to find a preventive cure for it, and the inquiries made by local public health authorities as to the steps which they can usefully take to disseminate information with regard to it amongst the inhabitants of their districts.

(2) The object of the memorandum, which is appended to this circular, is to summarize in non-technical terms our present knowledge with regard to the aetiology and incidence of cancer, and to offer for the consideration of local health authorities some suggestions which it is hoped may be useful to them in their efforts to inform public opinion of this important subject.

(3) The memorandum has been prepared by the Departmental Committee on Cancer appointed by the Minister, which is composed as follows:—

Sir George Newman, K.C.B., M.D., F.R.C.P. (Chairman); C. J. Bond, C.M.G., F.R.C.S. (Honorary Consulting Surgeon, Leicester Infirmary); Sir George Buchanan, C.B., M.D., S. Monckton Copeman, M.D., F.R.C.P., F.R.S., Major Greenwood, M.R.C.P. (Ministry of Health); Professor F. Gowland Hopkins, D.Sc., M.B., F.R.C.P., F.R.S. (Biochemical Department, University of Cambridge); Professor W. S. Lazarus-Barlow, M.D., F.R.C.P. (Middlesex Hospital, Cancer Department); J. A. Murray, M.D. (Imperial Cancer Research Fund); T. H. C. Stevenson, C.B.E., M.D. (General Register Office); S. Wyard, M.D., M.R.C.P. (The Cancer Hospital Fulham); Lt.-Col. A. B. Smallman, C.B.E., D.S.O., M.D. (Secretary, Ministry of Health).

(4) Apart from the appointment of this committee the Minister has directed the medical intelligence service of the department to keep in touch with developments of cancer investigation, and the department undertakes the prosecution of researches of an epidemiological and statistical character, both at home and internationally, in regard to cancer. Full and careful consideration will be given to any means by which it would appear that the Ministry, from its position as the central public health authority in England and Wales, can use the resources at its disposal to aid cancer inquiries, in co-operation with the Medical Research Council or the special cancer laboratories and research institutions.

(5) Two copies of this circular and memorandum are enclosed for the information of the local authority and a copy has been sent separately to the Medical Officer of Health. Further copies may be purchased through any bookseller or directly from His Majesty's Stationery Office.

I am, Sir,

Your obedient servant,

W. A. ROBINSON,
Secretary.

The Clerk to the
Local Authority.

MEMORANDUM ON CANCER.

1.—*Characteristic Features and Natural Course of Cancer.*

(1) In this memorandum the term "cancer" is applied to a group of morbid conditions known to affect man and lower animals in all parts of the civilized world. The members of this group differ widely in naked-eye and microscopical appearances. They also differ in the age of the individuals affected, in the rapidity with which they run their course and in their liability to become generalized throughout the body. But they all agree in that (i) they are manifestations of disordered overgrowth of some tissue of the body, (ii) they are at first local, (iii) they are not encapsuled, (iv) they progressively invade the deeper parts, (v) they readily undergo degenerative changes, (vi) they tend to become disseminated to distant parts of the body, (vii) they lead sooner or later to the death of the individual in the vast majority of cases.

(2) From the standpoint of preventive medicine and public health administration, there is a conspicuous contrast between cancer and groups of other morbid conditions, such as the acute infectious diseases or tuberculosis, for which the fundamental principles of prevention are well established. From the mass of medical experience and literature on cancer, old and new, we have an extensive knowledge of its natural course and pathological anatomy; from mortality and other records we know much about its occurrence and geographical distribution. But knowledge useful for its prevention is still far from complete. The root cause or causes on which the occurrence of cancer depends remain obscure. We do not possess any specific means of producing immunity against cancer, as we have against small-pox, nor have we any specific means of curing the disease analogous to quinine for malaria or arsenobenzol compounds for syphilis. In all these directions much valuable research work has been undertaken, both within laboratories and outside them, and such research is being further pursued. Study with this object ought to receive every possible support from central and local health authorities, from those responsible for hospitals and other institutions, from voluntary agencies and from the general public.

II.—*Extent of Cancer Mortality and its Increase.*

(3) In a population of 37,885,242 persons in England and Wales in 1921, a total of 46,022 deaths were attributed to cancer. These figures imply that out of each average million persons 1,215, and out of each thousand 1·21, died of cancer. The death-rate per 1,000 of the population attributed to cancer in England and Wales has gradually increased from 0·32 in 1851-60 to 1·12 in 1911-20, and 1·21 in 1921. To some extent this fourfold increase is due to the fact that a larger proportion of the population than formerly is now of those ages at which deaths from cancer commonly occur; but when full allowance has been made for this ageing of the population, the increase is from 0·33 in 1851-60 to 0·97 per 1,000 in 1911-20, and 1·01 in 1921, so that in the space

of two generations the recorded mortality has trebled.¹

(4) It has long been matter for discussion to what extent this increase has been due to improved diagnosis and more accurate certification of cause of death. There can be little doubt that these factors have been contributory, but unfortunately it has now to be recognized that they will not account for the whole of the recorded increase. Superficial cancers, such as those of the tongue or the female breast, were readily recognizable as such even 60 years ago, by the time death occurred. Yet in the 20 years' period 1901-21 (after making allowance for the ageing of the population) the mortality of males ascribed to cancer of the tongue has increased from 38 per million living in 1901 to 53 in 1921, and that of females from cancer of the breast from 148 in 1901 to 190 in 1921, increases of 39 and 28 per cent. respectively in twenty years. During the same period the mortality, similarly stated, of the total population from all forms of cancer increased from 841 per million in 1901 to 1,007 in 1921, or by 20 per cent. There is only one part of the body frequently attacked by cancer, the womb, in respect of which significant increase in mortality is not recorded during these twenty years—a fact which may in some degree be attributed to the fall in the birth-rate.

(5) During this period of twenty years, from 1901 to 1921, in which cancer increased by 20 per cent., the general death-rate fell by 32 per cent., that of infants by 45 per cent., and that from tuberculosis by 38 per cent., while substantial declines were recorded with respect to most other causes of mortality.

(6) An increase of mortality attributed to cancer is the common experience of modern civilization.

(7) The frequency with which different parts of the body are attacked by fatal cancer differs greatly in different countries; it may differ over a period of years even in the same country; and changes are occurring not only in respect of the parts of the body attacked by cancer, but also in regard to the ages at which deaths occur. In this country the tendency is for deaths from cancer to occur later in life than formerly, and this change has been going on, at least amongst females, for many years. The latest available returns show that the death-rate from cancer is not increasing for males up to 45 years of age, and for females up to 60. The most rapid increase is occurring in extreme old age.

(8) Great differences in regard to the parts of the body attacked by cancer also exist between the sexes. The excess of deaths of females (over males) from cancer is entirely due to malignant disease of the breast and generative organs; in most other parts of the body a considerable excess is recorded for males. There is a great difference between the relative frequencies of different forms of cancer amongst

¹ Another way of presenting the facts is this. In 1851-60, the mean population living in England and Wales is estimated to have been 18,996,916, of whom 60,196 (317 per million living per annum) were recorded as dying of cancer. In 1911-20 in an estimated mean population of 35,750,765 the number of deaths ascribed to cancer was 399,511 (1,117 per million living per annum).

married and single women. Cancer of the womb is more fatal to married and widowed, and cancer of the breast and ovary to single women. In 1911-20, for every 100 deaths of single women from cancer of the breast, there were 392 deaths of married women, for every 100 deaths of single women from cancer of the ovary there were only 272 deaths of married women, but for every 100 deaths from cancer of the uterus in the single women there were as many as 1,009 amongst the married women. During this period there were 463 deaths of married and widowed for every 100 deaths of single women, so the excess of deaths for the married is much larger than normal in the case of cancer of the womb, but smaller than normal in those of the breast and ovary. The death-rates for 1911-20 corrected for age distribution are not yet available, but for the years 1911-13 we have the following figures, which are death-rates per million women living corrected for age distribution: Cancer of the womb: Unmarried women, 169, married and widowed, 293; cancer of the breast: Unmarried women, 346, married and widowed, 238; cancer of the ovary: Unmarried women, 60, married and widowed, 31.¹

III.—*Proclivity to Cancer.*

(9) The large majority of people go through life, even to old age, without suffering from cancer, but the geographical and social distribution of cancer mortality shows that the risk of being attacked by cancer is one which is widely disseminated. In a broad sense, liability to cancer is not an attribute of any particular social class, profession or occupation. It is to be inferred, therefore, that the occurrence of cancer depends, to an important degree, on personal predisposing factors. For the purpose of this memorandum there would be no advantage in detailing or summarizing studies or speculations on the nature of those factors, on the specific, general or constitutional antecedents of cancer, or on the meaning of "proclivity" to cancer. Knowledge is not far enough advanced. It is right, however, to point out that *hereditary* predisposition to cancer has not at present been proved to be of any practical importance in man; that it cannot be asserted with scientific authority that the use of any particular article of food increases the liability to cancer, or prevents it from appearing; that no known drug or preparation will prevent its appearance or cure it when present; and that no danger of cancer has been proved to result from inhabiting houses or districts in which cancer happens to have been exceptionally common. There is no evidence to show that cancer is an infectious or contagious disease.

IV.—*Chronic Irritation as a Determining Factor in the Appearance of Cancer.*

(10) One certain fact about cancer is that it frequently follows on chronic and prolonged irritation. Not all tissues, however, are equally liable in this respect. The palm of the hand, for example, in spite

of its exposure to chronic irritation of all kinds, is probably never the seat of cancer. In the female breast cancer occurs far more commonly in the deeper parts of the gland than in the nipple, which is more exposed to injury. Some tissues show a special liability to develop cancer during chronic irritation, such as the skin of the face, the lips, insides of cheeks, tongue, lower part of bowel, neck of womb. Certain varieties of chronic irritation, too, are more liable to be followed by cancer than others. Thus, in the lip, long continued irritation by a clay pipe is particularly dangerous; in the tongue, irritation by a jagged tooth or badly fitting tooth-plate; in the womb, the chronic ulceration which may follow confinement. Again, syphilitic disease affecting the tongue or female external generative organs, or tuberculosis of skin (lupus) affecting the face, particularly if it has necessitated prolonged treatment, is liable to end in cancer. And lastly, workers in tar such as briquette makers, workers with anilin or paraffin, chimney sweeps, and mule-spinners are apt to suffer from cancer in special parts of the body as a consequence of repeated irritation by the particular agent concerned.

(11) This liability of cancer to follow chronic irritation of so many different types is remarkable, and leads to the supposition that beneath them all there lies some common factor—as yet unrecognized—which is fundamental to the passage of a chronic inflammatory and non-cancerous condition into one that is definitely cancerous. In one variety of cancer (rodent ulcer) the distribution of the new growth is such that it suggests a close relationship with the nerve supply of the affected part. How far this is true and how far modifications of the body itself as distinguished from the chronic irritant play a part in the ultimate production of the cancer it is impossible to say in our present state of knowledge.

V.—*Prophylaxis.*

(12) While considerations such as those in III above show how far we are from being able to say how cancer is to be avoided, those in IV indicate that there are at least some provocative causes of cancer which can be guarded against. Since cancer occurs more commonly in certain sites, it is prudent to notice and remove causes of chronic irritation in these sites. Apart altogether from cancer, people should attend to these conditions in the exercise of common care for their general health and fitness.

(13) In this category, for example, and for reasons just given, come the removal of rough stumps of teeth or replacement of badly fitting dentures; a change of habit if pipe-smoking is found to produce soreness on the same spot of the lip or tongue; an alteration of clothing which causes irritation of particular regions of the body—for example, the breast; the avoidance of constipation and other like matters. On the same basis the possibility of establishing a chronic irritation in a region liable to cancer gives an additional reason for obtaining advice and treatment in disorders of the stomach, bowels, or womb. Finally, special precautions, the nature of which is well known to those concerned, must be adopted in certain occupations (tar, &c.)

¹ Further details will be found on p. lviii of the 76th Annual Report of the Registrar-General (1913).

known to entail superadded and specialized risks of cancer.¹

VI.—*Diagnosis of Cancer.*

(14) For reasons that are indicated in the next section (Treatment) early diagnosis is of the greatest importance. This means not only diagnosis of the actual existence of cancer, but, even more, diagnosis of the existence of abnormal conditions that are common precursors of cancer. Cancer itself in its early stages is almost invariably unaccompanied by pain, and is sometimes painless throughout. This painlessness of cancer in its early stages is one of its most insidious dangers, since it leads the patient to delay seeking medical advice. Were cancer as painful in its early stages as toothache, there would be far fewer of those pitiable cases in which the patient first seeks advice when the cancer has reached a stage beyond all but palliative treatment.

(15) Early diagnosis obviously depends upon co-operation between the patient and the doctor. Medical advice should be sought at once particularly if a tumour or lump is found in the breast, if an ulcerated condition exists on the tongue, lip or skin which does not heal in a few days, if there is persistent hoarseness, if a mole or wart shows a tendency to grow, if blood or mucus is passed with the stools, if there is bloody or offensive discharge at other than the normal monthly periods, especially at the change of life or after it has passed. Even with the greatest care and skill doubtful cases occur; but only after careful medical examination can it be decided whether such conditions are or are not indicative of cancer, and those who seek advice in these circumstances are taking a wise course quite apart from cancer possibilities. An abnormality is there, and whatever it is due to it should be treated and not nursed in secret.

VII.—*Treatment*

(16) If a person has not recognized that something is wrong—and such cases occur—nothing more can be said. But very many persons are aware that something is wrong, fear it may be cancer and put off consulting a doctor because they think that if cancer be diagnosed an operation will be necessary. Quite apart from the facts that anaesthetics and antiseptics have robbed operations of many of their terrors, and that many such cases would not be cancerous at all, the chances of a patient must be better the earlier

he or she comes under treatment. Most medical authorities believe that in cancer early operation affords the best chance to the patient, although they would not feel justified in stating that all risk of recurrence is necessarily removed by operation, even if undertaken in an early stage of the disease. But there is indubitable evidence that removal by operation, though ultimately followed by recurrence, enables many people to live a natural life in comfort for considerable periods, while in advanced cases such removal may relieve or prevent prolonged suffering. There are many cases, moreover, in which cancerous growths have been removed once and for all, the patient has lived for years afterwards without recurrence, and has ultimately died from an entirely different cause.

(17) And, lastly, evidence is accumulating that in some varieties of cancer, and in some situations, radium or X-ray treatment, or diathermy, carried out by expert medical practitioners, offers at least as good a chance to the patient as surgery, without the attendant disadvantages, and in other cases it may be tried when surgery is out of the question. *The essential point is that the patient should not postpone or delay seeking competent medical advice, and, above all, should not waste time or money by trying quack remedies which at best are useless, and at worst aggravate the disease. In any condition in which cancer is suspected, immediate and decisive action is necessary.*

(18) The actual prospect of length of life after measures for the removal of cancer have been taken is not a matter for dogmatizing, but without question the earlier these measures are adopted the better.

VIII.—*Local Health Authorities and Cancer Questions.*

(a) *Propaganda.*

(19) Many local authorities, on the advice of their medical officers of health, undertake invaluable "propaganda" in relation to certain diseases by means of public notices, advertisements, broadcast leaflets, lectures, cinemas and the like. The considerations set out above show how greatly cancer differs, in regard to the applicability of these methods, from a disease such as small-pox, for which there is a sure preventive to be proclaimed, from other diseases of the infectious class where individuals must be urged to take precautions for the safety of their fellows, or from diseases such as the venereal group for which special and gratuitous treatment is provided out of the public funds, and requires to be advertised. Much caution is obviously needed in announcements to the public on cancer in order to avoid overstatement, the making of promises which are not warranted by evidence, or the production of needless and mischievous apprehension of cancer. If all this is realized, knowledge of some of the main facts of cancer (negative as well as positive)—such as are indicated in this circular—may usefully be spread through the ordinary agencies of public health departments, notably by instruction at welfare

¹ Every medical practitioner attending on, or called in to visit, a patient whom he believes to be suffering from—

(a) *epitheliomatous ulceration* due to tar, pitch, bitumen, mineral oil, paraffin, or any compound, product or residue of any of these substances, or

(b) *chromic ulceration* due to chromic acid or bichromate of potassium, sodium, or ammonium or any preparation of these substances,

occurring in a factory or workshop, is required, under the Home Office (Factory and Workshop) Order of 28th November, 1919, to notify the case to the Chief Inspector of Factories at the Home Office; and a similar obligation is imposed on the occupier of a factory or workshop to send written notice of every such case to the Certifying Surgeon and Inspector of Factories for the District.

centres, by midwives and maternity nurses,¹ and by social welfare workers. It need hardly be added that it is important for the medical officer of health in advising on these matters to enlist the counsel and assistance of other medical men, whether specialists or general practitioners, in his area.

(b) Facilities for Diagnosis and Treatment.

(20) It is not contemplated or suggested that there should be established throughout the country a public cancer service, analogous to the services for tuberculosis or venereal diseases, or that for treating acute infectious diseases. Even if such a service were considered desirable, it would be out of the question until other matters, such as the improvement of undergraduate and post-graduate medical education in cancer diagnosis and treatment, have been further developed. But public health authorities, insurance committees, boards of guardians or other public bodies concerned should not feel discouraged from individual action within the competence of these bodies from assisting in securing better facilities for diagnosis or more effective treatment of cancer in the areas or institutions under their jurisdiction. It has, for example, been suggested that local authorities, in conjunction with the local representative bodies of the medical profession in suitable areas (acting through a special cancer committee or otherwise) might periodically undertake a review of such questions as the following, considering in each instance whether steps could and should be taken to meet the requirements of the area and the medical profession within it, and enlisting the help of all who are likely to be of assistance:—

(i) Improving the local facilities for clinical consultations and for pathological examinations;

(ii) Improving the local facilities for cancer treatment (operative, or provision of X-ray and radium apparatus), and considering the adequacy of arrangements for this purpose at hospitals, local institutions, &c., which serve the area;

(iii) Improving the facilities for transport of patients;

(iv) Arranging locally for post-graduate demonstrations, lectures, or courses on cancer for medical men practising in the area;

(v) Arranging locally for the education of the public as indicated in paragraph 19.

(21) Should such local medical consideration of cancer problems lead to applications for the assistance or co-operation of public health authorities as well as of voluntary agencies and individuals, the Minister is confident that these applications will be considered practically and sympathetically by those to whom they are addressed. The department will be glad at any time to receive communications on the matters above outlined in cases in which it would appear that its action would be helpful or its knowledge of local progress in dealing with cancer questions might be increased.

Annotations.

Elephantiasis: Clinical Review and Attempt at Experimental Production (G. D. Mahon, *American Journal of Medical Science*, June, 1923).—The author was at one time of the opinion that the hypertrophy and œdema which characterize elephantiasis was caused directly by the action of pathogenic bacteria. Bearing this in mind experiments were made to prove it by experimenting on dogs. Streptococci were grown from tissue taken from the leg and were injected subcutaneously and intravenously, but the results were negative.

In some cases the removal of the lymphatics, and particularly the ligation of the venous return, produced œdema of the leg for a variable period; but the œdema did not persist for any length of time, and a condition resembling elephantiasis never occurred.

Dysentery in the Colliery Areas. Five Months' Work in the Jheria Mining Settlement (G. C. Maitra, *Indian Journal of Medical Research*, vol. xi, No. 1, July, 1923).—The majority of dysentery cases observed on the coalfields was found to be of bacillary nature.

Amongst seven positive cultural findings, *Bacillus dysenteriae* Flexner "Y" was found to be in greater proportion than *B. dysenteriae* Shiga.

Classical dysentery among the miners appears to exist in a very small proportion in comparison with the high figures for bowel diseases.

Hookworm disease is very common, and in the light of present knowledge stands out as a very important predisposing factor in the heavy incidence of bowel complaints among the miners.

The monsoon prevalence of bowel diseases in the coalfields is attributable to varied and polluted water supply. There is also a probable correlation between the hookworm activity and monsoon prevalence of bowel diseases, but further evidence is necessary to establish such relationship.

In the coalfields at present there is so much overlapping of hookworm disease and bowel diseases of bacterial origin that the latter can only be studied and solved satisfactorily after controlling the former.

Current Literature.

BULLETIN DE LA SOCIÉTÉ DE PATHOLOGIE EXOTIQUE.
June 13, 1923.

Anti-staphylococcal Vaccine Preparation (P. Noel Bernard).—After disinfecting the skin with tincture of iodine, a drop of pus is drawn by a pipette from a large unopened furuncle and put in the condensation water of a tube of agar. A platinum wire is immersed in the condensation water and then put into a second tube. The two tubes are

¹ The Central Midwives Board issues an instructional note on cancer to all midwives on registration, and includes questions on cancer in women in their examination for certificates.

turned down so that the condensation water is on top of the agar. In the second tube about four to seven very isolated colonies are obtained, which reach a diameter of 5 mm. in twenty-four hours at 37°. A colony is sown in the condensation water of the agar in a Roux dish, and placed flat in the oven for twenty hours. It is then scraped in 50 cm. of physiological water. The microbial dilution is centrifuged and washed three times by centrifugation. The sediment obtained is diluted in 50 c.c. of pure glycerine at 30° Baumé, sterilized, and put in the glaciere at about 4°. All the germs of the dilution are dead in one to three months. When preparing the vaccine the contents of eight flagons are mixed, each containing a dead culture of different origin; for every 600 c.c. physiological water 50 c.c. of glycerined dilution is added. This corresponds to about 600,000 million microbes to a cubic centimetre. The vaccine is administered daily in dose of ½-1 c.c. the first day and 1 c.c. the following days. The dose is increased by 2-3 c.c. per day for adults, and decreased for children according to age.

Paralysis and Cutaneous Hyperæsthesia during Anti-rabies Treatment (L. Robert).—In the treatment for the prevention of rabies, commenced thirteen days after the patient had been bitten, headache and fever appeared about the time of the sixth injection; and six days later, after the twelfth injection, the patient suffered from exceedingly severe spinal pains, hyperæsthesia and burning sensation in the skin of the body, over the area used for the injections; stiffness of the legs, trembling of the upper limbs, and vesical and rectal paralysis and complete loss of appetite. The patient was treated with quinine, bromides, valerian and rhubarb, and gradually recovered in about sixteen days. The author considers this to be a case of attenuated rabies due to the injections.

Does Quinine act upon the Schizonts of Plasmodium vivax when Intraglobular (M. Leger and E. Bedier).—The recurrence in one of the authors of an attack of malaria due to *Plasmodium vivax* was made the occasion for research as to the action of quinine upon schizonts within the red corpuscles. Blood examinations were made at suitable intervals. The first dose of quinine (0.5 gm.) was not taken until sixteen hours after the highest point of the fever, when more than half of the red corpuscles contained schizonts. After further doses of quinine, the blood twenty-six hours later showed the same proportions. The other observations point also to the conclusion that the development as a whole was arrested by the quinine.

The authors urge that the quinine treatment should not commence until after the temperature has fallen from the maximum, as the effect on the parasite is as good, and the drug is better supported by the stomach.

Spirochætal Blood Infections in Native Algerian Children (A. Catanei).—Observations carried out at

Boufarik, thirty kilometres from Algeria, show that apparently healthy children are reservoirs of recurrent fever virus, and this is only detected by examination of the peripheral blood. Spirochetes were found in children with no morbid symptoms on two visits at intervals of ninety-eight and fifty-four days.

An Error of Diagnosis: Recurrent Fever mistaken for Sleeping Sickness (M. Blanchard and G. Lefrou).—A diagnosis was made of a case with all the clinical symptoms of trypanosomiasis with meningitis. No hamatozoa or other parasites were found. At a later examination of the blood in a fresh thick preparation, an agitation of the red blood corpuscles was seen, and the malady was determined as trypanosomiasis without specifying the causative organism; the patient was accordingly treated, but showed no signs of recovery. At a methodic examination of the sediment of centrifugation of the blood no trypanosomes were seen, but abundant spirochetes of recurrent fever.

Pulmonary Syphilis simulating Cavitary Tuberculosis in a Malagash (Fraissinet and Martin).—A soldier leaving hospital on January 20, 1923, to return to Madagascar, was taken into the military hospital at Marseilles suffering from fetid bronchitis and general bad health. The malady commenced, he stated, by emaciation and coughing after a short sojourn in Syria; he later showed serious pulmonary symptoms. The only illness he had had previously was a few attacks of malarial fever. When examined on June 26 the facies were emaciated; mucous surfaces pale; skin dry and farinaceous; muscles flaccid. The patient weighed 52 kilos, complained of general fatigue, dyspnoea and obstinate cough, and expectorated a great deal. The left lung sounds were normal; the right sounds were consistent with severe tuberculous lesions. Injections prepared from the patient's sputum failed to produce tubercular lesions in guinea-pigs. Under specific treatment for syphilis the patient recovered rapidly.

A Particular Parasite of the Tench. Culture of the Trypanosomes of Fish (G. Franchini). The larva described was found in the blood and organs of one tench out of twenty examined. The parasite has a nucleus, sometimes a nucleus and a centrosome; it is seldom isolated, and is often found in the white blood corpuscles. Reproduction is effected by bi-partition of the nucleus. Morphologically it resembles *Globidium*, described by Neumann (1909), except the latter is found in the red blood corpuscles.

The trypanosomes of fish are rare and very difficult to cultivate; this is often due to bacteria which abound in the blood of fish.

Contribution to the Study of North African Myiasis. Two Cutaneous Cases due to Sarcophaga (G. Senévet and G. Ebert).—Larvæ taken from a case of myiasis in Morocco were found to produce *Sarcophaga tuberosa* Pand after preservation in a

Petri dish for about three months. This is the first case observed of human myiasis due to *Sarco-phaga*. The second case was a girl of Algeria, aged 14 years, suffering for six years from favus. Larvæ taken from pus of inflamed tumours of the scalp were identified as of the subfamily *Sarco-phaga*. The patient was rapidly cured, after the application of alcoholized water, with bi-iodide and bichloride of mercury added.

Elephantiasis in Morocco (P. Remlinger).—This malady is prevalent in all parts of Morocco in benign form. The disease generally affects the scrotum and lower limbs. Europeans till now have been spared, but it affects white and coloured natives alike, more frequently men than women, between the ages of 20-30 years.

Clinically the disease is the same as in other countries; as regards ætiology, it resembles more elephantiasis nostrors than *E. exotica*.

Intravenous Injections of Arsenic in Natives. Rapid Cure in a Case of Syphilitic Hemiplegia. (L. Le Dentu).—606 and 914 have been administered intravenously for the past fifteen years with very good results in Indo-China, Madagascar and French East Africa. No nitroid crisis has ever been observed; the only troubles occurring are slight congestion of the face, nausea and lypothemia. Amongst natives reaction is very rare.

An ordinary fine needle is used about 2 cm. long, and the doses are progressive; with 914 the dose has never exceeded 0.90 gm. The thick veins in the bend of the arm are the easiest for injection.

A patient, aged 26 years, was completely cured of hemiplegia in three weeks with intravenous injections of 0.30 to 0.90 gm. of arsenobenzol.

Demographic Statistics of Dakar in 1922.—E. Heckenroth and E. Bergonier).—The present population of natives of Dakar is 29,625, and of Europeans 2,511, this is exclusive of naval and military forces. The totals exceed those of 1921. The numbers of births of Europeans for the year is 74 and deaths 75; of natives, 1,042 births, 448 deaths; in both cases the number of deaths of males exceeds the number of females.

Congenital debility appears to be the cause of most cases of deaths, and the numbers due to pneumonia and pulmonary tuberculosis are also high. Only one case of death due to trypanosomiasis is recorded, and only one fatal case due to cerebro-spinal meningitis. The percentage of deaths of 1922 is 26.5, the lowest since 1902, an average of 65 per month, most cases occurring during the month of October.

On Dr. Nogue's Communication on the Infantile Posology of Quinine (G. Fida).—The doses proposed by Dr Nogue are considered too small. The dosage should be proportioned to the weight of the child and not according to age. Probably children eliminate quinine rapidly.

M. Leger agrees and draws attention to the higher dosage required for *Plasmodium præcox*

compared with that which will cause the prima disappearance of *P. vivax* from the blood, and the greater likelihood of recurrence of *P. vivax*.

Coccidiosis of the Biliary Duct of a Lizard (Mm. Phisalix).—A new coccidium has been found in lizards (*Scincus officinalis*) of Tunisia. It developed exclusively in the biliary duct, more often in the liver, and sometimes in the bladder. Only once was it found in the intestine. All cases affected were adults, and the affection appeared to be of long standing. In some cases filaria existed in the blood, or cestodes in the intestine at the same time as the coccidia.

Encephalitis lethargica in Cochinchina (Lalou, Bonnaire and Pons).—Clinical histories are given of five cases of the native hospital at Cholon, studied at the Pasteur Institute at Saigon. The disease has been produced experimentally by inoculation in rabbits. The duration has been found to diminish by successive passages down to a minimum of six days.

Notes on the Animal Epidemiology in Cochinchina (L. Broudin).—The number and diversity of the epizootics occurring in 1922 in Cochinchina were very great. The principal maladies were bovine plague and pasteurellosis, which sometimes co-exist in the same herd of cattle. There was also an epizootic of barbone and a violent outbreak of *Trypanosoma annamense* Laveran 1911 in the Cantanh region, which carried off half the horses affected. Cantanh is a dangerous site for Indo-China surr. All these diseases are more frequent in the rainy season.

On a Human Hamogregarina (L. Nattan Larrier).—This is a further note on a hamogregarine observed in the blood of a patient in the French Congo. The parasite has been named *Hamogregarina equatorialis*, and is morphologically different to other hamogregarines. They are mostly lentil forms, plano-convex, length 5-7 microns; width is about one-third length. The nucleus is generally in the middle or just marginal; the diameter varies from 0.4 to 0.6 microns. One-third are elliptic forms 6.5 to 7 microns; diameter 2.2-2.5 microns. All forms were extra-globular. Many of the elements were encysted. Hamogregarines found by puncture of the ganglia differed from those found in the peripheral blood of the same individual. Illustrations are given of all the forms.

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Original Communication.

THE WITHDRAWAL OF FLUID FROM THE CHEST BY A TROCAR AND CANNULA AND SYPHONAGE WITHOUT EXCISION OF RIBS.

By Sir JAMES GANTLIE, K.B.E., M.B., F.R.C.S.

A COLLECTION of fluid in the pleural cavity I have treated by the method I have so long used for drawing off pus from a liver abscess and from various parts of the hepatic region. The usual plan of dealing with an empyema is a familiar one, namely—cutting down upon the rib or ribs overlying the effusion in the pleura, evacuating the pus, and, after packing the cavity, allowing it to heal. The result, if recovery takes place, being an extensive scar, a more or less contracted chest on one side, a disturbance of the action of the heart, shortness of breath from loss of breathing capacity due to adhesions of the lung to the chest wall, and a lessening of vital capacity. I regard this operation as unjustifiable as in the case of the removal of pus from the liver in the case of liver abscess. For twenty-five years I have practised removal of pus from the liver by the trocar and cannula, and subsequent syphonage method, first shown me by Sir Patrick Manson in Hong-Kong when I worked in partnership with him from 1887 to 1889. Subsequently in Hong-Kong, and in London, where, at the Seamen's Hospital, at the Albert Dock Hospital in connection with the London School of Tropical Medicine and in private practice, I treated all cases of liver abscess by the same method. The cases thus operated on at home and abroad numbered 147, the recoveries to 124 and the deaths to 23; I cannot claim so extensive an experience in the treatment of removal of pus from the pleural cavity by the same method, being but 21 in number, namely—6 in Hong-Kong and 15 in Britain; these were all successful. My operation for liver abscess by syphonage has had only three imitators, and, as far as I know, no imitator in the case of withdrawal of fluid from the chest. The stereotyped operation of removal of ribs, opening the pleural cavity, allowing of free admission of air, has been, and is being, followed religiously, so that my example has not been followed by my surgical colleagues, not on account of want of success, for that cannot be said in regard to either procedure, for my results in liver abscess operations stand by themselves. My plan has been condemned by my surgical critics as not being "surgery," that a man who followed such practices was a surgical coward "who had not cut his milk teeth in surgery," "that I like to look my enemy in the face," &c. By such swashbuckling phrases the plan Manson and I have advocated has been kept *under*. The reason is that the operating surgeon who is called in is expected to finish his operation and be done with it. The practitioner does not want him calling day after day to look after the progress of the case, whether it is the chest or the liver that is the seat of the operation. Hence the removal of ribs, opening of pleura or

peritoneum, or both in cases of liver abscess. The operating surgeon is driven to hasten his work, more especially if the operation is carried out at the patient's home in the country.

Concerning removal of pus (I will call it pus, as that is the usual material to be dealt with) from the pleura by trocar and cannula, I should here mention the fact that the operations for liver abscess in the 147 cases mentioned were all *trans-thoracic cases* in which the trocar and cannula were introduced between the ribs on the right side, and traversed the pleura, diaphragm and peritoneum to reach the deep-seated pus at the upper and posterior aspect of the liver. The liver abscesses which "point" below the ribs and are easily reached from the anterior wall of the abdomen are not regarded as of sufficient importance surgically to be dealt with here. Of these I have had a full experience. I never introduced my trocar and cannula by way of the anterior abdominal wall, nor even passed an exploratory needle into the liver or anywhere in its region without first making an incision and examining the liver before making the puncture. Any surgeon who takes such a step deserves to have all the epithets hurled at him my critics have showered on myself, and I think that is the reason perhaps of my surgery being traduced. Had I published such a proceeding as being for a moment worthy of being considered it would be a slight to my sanity beyond my belief of even my direst enemy's intentions. I speak strongly, for I have some reason to.

The signs and symptoms of fluid in the cavity of the pleura are so universally dealt with in textbooks that it is not necessary to go over the well-known ground here.

Dressing and apparatus employed in the operation for removal of the fluid from the chest (or incidentally from the liver) by syphonage are:—

(1) The usual preliminary methods of preparation required for any operation on the chest or abdomen dictated by common sense and every-day surgical routine.

(2) A Record syringe, 10 c.c. in capacity, $2\frac{1}{2}$ inch. long needle, and the needle of 1.2 millimetre, such as is used in searching for pus in the body cavities. The barrel of the syringe must be of glass, so that (a) the nature of the fluid may be seen; (b) the depth of the fluid from the surface may be at once recognized as the point of the needle reaches pus.

(3) A scalpel to make a "snick" in the skin before introducing the hollow needle over the seat of the puncture to be made.

(4) A trocar and cannula of a size (diameter and length) suitable to the passage of the apparatus between the ribs (see diagram).

(5) India-rubber tubing of a length, thickness and elasticity suitable for introducing through the cannula when the trocar is removed from the cannula (see diagram).

(6) An introducing rod of metal, forked at both ends (see diagram for dimensions, &c.).

(7) Glass tubing for connecting the india-rubber

(see diagram) tubes, and thus showing the nature of the fluid being extracted.

(8) A douche clip to be slipped on the tubing close to skin end of tube (see diagram).

(9) A glass bucket in which to receive the fluid extracted, to be placed on the floor near by. The fluid in the bucket has to be sterilized or carbolyzed.

(10) A Spencer Wells forceps, which is clipped on one side of the outlet, will keep the tube weighted and thus keep the tube to the bottom of the fluid, and thus prevent entrance of air.

(11) A piece of tape and safety-pin to secure the tube to the bed sheet and cradle to prevent the end slipping from the bed.

(12) A piece of strapping to secure the tube to the side of the body.

(13) A cradle to place over the body, to which the tube may be secured.

(14) Cover the whole with blankets, &c., to extent demanded.

Operation.—Place the patient on an operating table or on a bed at a convenient and suitable position to allow of as free breathing as possible. An anæsthetic to be administered when breathing and general condition allow; or the part may be cocained; or if the patient is dangerously collapsed the operation may be carried out without either, the actual pain not being of a degree to forbid this being done.

Carefully by percussion, auscultation, and by the tuning fork (Cantlie's, made and figured by Mayor and Phelps, New Cavendish Street, London, W., in their catalogue, and fully described and figured in the *JOURNAL OF TROPICAL MEDICINE AND HYGIENE*, January 15, 1914, No. 2, Vol. XVII) decide as to the exact situation of the fluid in the chest.

Introduce the point of the needle of the aspirating syringe between the tenth and eleventh ribs, just behind a vertical line drawn downwards from the highest point of the axillary hollow. "Snick" the skin over the chosen point by a scalpel to prevent a pledget of skin, as the puncture is being made, from being carried in the hollow of the needle and thereby blocking it.

Before introducing the needle push home the plunger of the syringe to the bottom of the barrel; steady the syringe with the point of the needle held against the "snick" in skin, push the barrel into the trunk, then push the barrel from off the steadied plunger—that is, do not pull the plunger out of the barrel, but push the barrel off the plunger. Thus the moment the end of the hollow needle reaches fluid it will rush into the barrel and demonstrate the exact moment pus is reached. Stop pushing needle further in once the pus is seen. Do not withdraw off more than a small quantity of fluid, but withdraw the syringe needle and plunge the trocar and cannula into the puncture and tract of the needle between the ribs to a depth indicated by the needle and no more.

Withdraw the trocar and cover the mouth of the cannula by applying the thumb over it.

The india-rubber tube already prepared for

insertion by being stretched over the steel rod is at hand. Remove the thumb and introduce the stretched tube in the rod through the cannula to the bottom of the cavity. Slip the cannula over the stretched tube and lay it aside. The tube is now partly within the chest and partly without some 3 inches within and 9 inches without. Pass the douche clip over the protruding tube, close up the skin and close the tube. The glass connection is now made to the end of projecting part, and introduced into another rubber tube being long enough to reach the bottom of the glass bucket which is two-thirds filled by disinfectant fluid, and the end held down by being weighted by a Spencer Wells artery forceps. The ring clip around the tube near the skin is undone, when the fluid from chest will flow into the bucket and the chest be emptied. No air is admitted. The tubing (see above) is fixed to bedding, and the cradle covering the patient is covered with bedclothes placed over the protecting cradle. The rate of the escape of the fluid contents of the chest is important. When the ribs are removed the fluid rushes out, and when a drainage by syphonage is made the rate of escape is more gradual, and can be reduced by raising the bucket off the floor by placing it on a stool or on a chair, so that the suction of the cavity is reduced to a minimum. The slowness of escape will allow the lung to expand very gradually as the fluid is withdrawn, no air being allowed to enter the cavity as it increases, "sucks," as it were, the lung, so that no adhesions occur, and future expansion is so slow that the lung may attain full expansion, and diminished capacity of the cavity of the pleura prevented.

Percussion, auscultation, and especially the use of the tuning fork, will proclaim the lung expansion, and thereby indicate when the large drainage tube may be removed and a smaller one inserted in its place. This may be introduced along a smaller probe which may be covered with absorbent wool. The outer opening may be cleared with a probe from time to time until all signs of a cavity existing being contra-indicated, the surface wound is allowed to heal.

This article has grown to so great a length that further remarks may require to be presented later.

Bacteriolytic Enzyme (O. T. Avery and Glenn E. Cullen, *Journal of Experimental Medicine*, vol. xxxviii, No. 2, August, 1923).—Pneumococci possess an active intracellular enzyme which causes lysis of heat-killed pneumococci of the same and heterologous types, and to a less degree of a closely related organism, *Streptococcus viridans*.

The optimum reaction for lysis lies between pH 6 and 8.

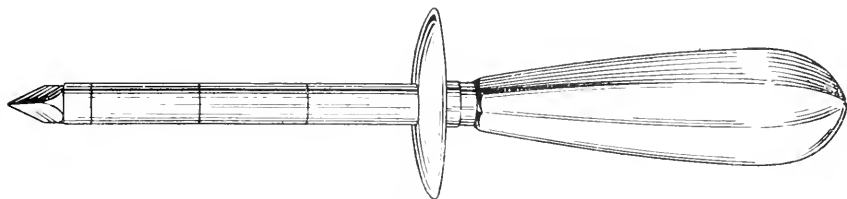
The bacteriolytic action is proportional to the concentration of the enzyme.

Heating the enzyme for thirty minutes at 60° C. destroys its activity.

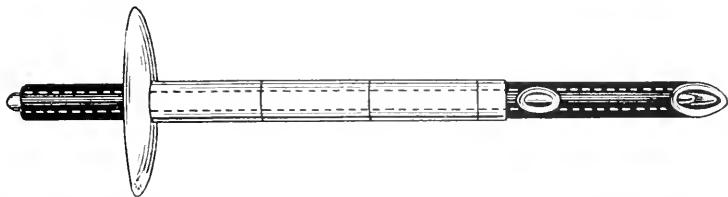
The possible relation of the enzyme to autolysis is discussed.



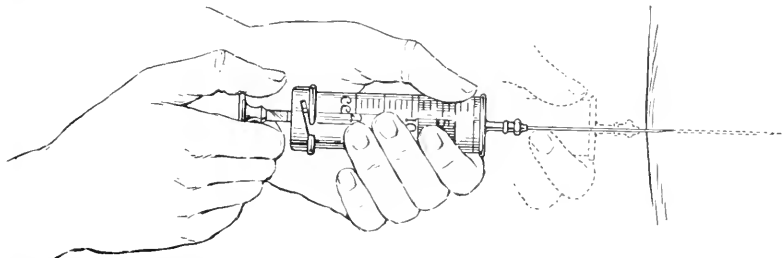
Metal rod, forked at either end, on which the india-rubber drainage tube is introduced.



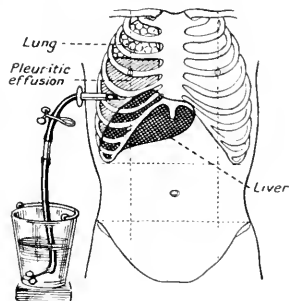
Cantlie's trocar and cannula for liver abscess, adapted for puncturing the chest.



The metal rod introducer with its forked ends (the fork drawing has been omitted at the left end of rod) catching the rubber tubing and stretching the rubber and narrowing it so as to be fit to pass through the cannula. Cannula left in side after trocar is withdrawn and the stretched tube on metal rod pushed along the cannula and entering cavity. (In this diagram the fork has, in error, been made plain.)



The needle of this Record syringe is made to perforate the chest with the plunger pushed home to the bottom of the barrel, so that no air can enter. Note that the button of the piston rod is held steady whilst the barrel of the syringe is pushed forwards of it into the chest and thus acts as a sucker whilst the instrument is being introduced. On the right of the diagram is the right side of the body to be operated on. A needle is being made to puncture the skin. The barrel of the Record syringe has its plunger driven home to the bottom of the barrel and the button on its piston rod steadied. The barrel is pushed off the plunger and the needle carried forward in the chest, thus forming a cavity, into which the pus is sucked.



Pus in right side of chest. The needle of Record syringe pushed into the pleuritic effusion. (The needle should travel between 10th and 11th ribs.) "Douche clip" on tube to be used when required (see text). Glass tubing where india-rubber tubes are connected. Glass bucket with disinfectant fluid to receive end of syphonage tube, with Spencer-Wells forceps to hold end in position.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 15, 1923.

THE FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE (5TH CONGRESS), SINGAPORE.

In September, 1923, the 5th Congress of this association assembled at Singapore. At the close of the Congress all agreed that the meeting had proved the most successful of all the meetings since

the foundation of the Association in 1910. The Honourable A. L. Hoops, M.D., D.P.H., B.A., Trinity College, Dublin, the Principal Civil Medical Officer of the Straits Settlements, and Member of the Legislative Council, Straits Settlements, was elected as President of the Congress.

In a letter to the editors of the Journal, Dr. Hoops states that no fewer than fifteen countries were represented by 300 medical men, and the meetings lasted three weeks, the second week being occupied by excursions to many places of scientific importance in the Malay Peninsula. In these excursions no fewer than fifty of the foreign members of the Far Eastern Association of Tropical Medicine took part.

The Presidential address of Dr. Hoops is as follows:—

THE PREVENTION OF DISEASE IN THE TROPICS.

An Address delivered before the 5th Congress at Singapore on September 3, 1923.

Your Excellency, Ladies and Gentlemen,—On behalf of the members of the Fifth Congress of the Far Eastern Association of Tropical Medicine, I thank Your Excellency for honouring us by your patronage and for the gracious words of welcome which you have addressed to us.

It is a happy augury that this Congress should have been opened by one so deeply interested in public health problems, and so well able to afford aid towards their solution, one whose name will ever be associated with the construction of the great new General Hospital in this city.

That Your Excellency and Lady Guillemaud are kindly extending hospitality to the members of our Congress during the week, and that it is Your Excellency's intention to lay the foundation stone of the new College of Medicine, as part of our Congress programme, are further proofs of your sympathy with our Association. One of our objects, the elevation of the standard of medical education, will be greatly advanced in this country by the erection of the new college buildings. These will provide sufficient space and adequate equipment for the instruction of our medical students in accordance with the recently revised curriculum. They will also afford scope for post-graduate study, for research work, and for the correlation of curative medicine and remedial surgery with the prevention of disease, which is our ultimate goal.

I have, through Your Excellency, to express our gratitude to the Governments of British Malaya—the Straits Settlements, the Federated Malay States, the Unfederated Malay States of Johore and Kedah and the Municipalities of Singapore and Penang—for their generous donations, which have enabled this Congress to be held on a scale befitting the greatness of its objects.

The Municipality of Singapore has given the free use of the Victoria Theatre and Memorial Hall for our meetings during the whole period of the Congress.

Our thanks are due to many non-medical friends

who are giving hospitality to delegates, lending motor-cars, and helping us in other directions, to the Boy Scouts and Girl Guides who are providing orderlies for duty here during the whole week, to the various firms who have assisted us, and to all who are in sympathy with our aims.

The large and representative attendance of the community—including Legislative Councillors from all the Settlements—present at this meeting, evidences the widespread interest taken in tropical medicine, and provides our Association with the opportunity of getting in close touch with the general public at the very opening of the Congress.

We want your help, ladies and gentlemen, and you want ours. This is the day of preventive medicine, which requires for its success the intelligent co-operation of every educated man and woman, whether medical or lay.

While we share the regrets of Dr. A. E. Horn, C.M.G., the original President-Elect of this Congress, that he is unable to attend owing to his duties as Medical Secretary at the Colonial Office, we rejoice that his position there will enable him to give practical effect to the lively interest which he takes in our projects.

Owing to Dr. Horn's resignation the honour of presiding at the Fifth Congress has been conferred upon me.

I will not follow my four distinguished predecessors in this office by delivering a scientific address. I prefer rather to deal with the subject of public health from a wide standpoint, in its relation to two of the declared objects of our Association. These are: "To enlighten and direct public opinion in regard to the problems of hygiene," and "To form habits which conduce to the prevention of disease amongst the native population."

Reference is necessary to the events in our previous history which bear upon our present and future development.

Our Association was founded in the year 1908 by a small gathering of medical men from various tropical countries, who met in the ancient city of Manila.

The first Congress was held in the same city in 1910, under the presidency of the late Dr. Paul C. Freer, Director of the Bureau of Science, Manila, in whose brain the formation of the Association originated.

At the second Congress, held under the presidency of Dr. Atkinson in Hong-Kong early in 1912, Heiser, whose absence to-day we all regret, formulated the idea of international action against beriberi, and suggested the introduction by the countries affected of a tax on over-polished rice.

The third Congress, held at Saigon under the presidency of General Clarac late in 1913, was notable amongst other things for the thorough discussion on amebic dysentery, and for the lessons learnt from Montel on the development of maternity and infant welfare work amongst the peasantry.

By Montel's agency a number of small maternity

centres with native midwives attached have been provided, in rural areas, throughout French Indo-China.

His example is now being successfully followed in the Dutch East Indies.

A lapse of eight years in our meetings, due to the Great War, left our Association almost moribund.

We are grateful to our Dutch brothers, who, with commendable energy, circularized their medical colleagues in other countries, for a period of more than one year, revived their interest, and assembled a large number of delegates for the fourth Congress, at Weltevreden, in Java, two years ago.

The President, Dr. de Vogel who, in his learned opening address, reviewed the progress of tropical science during the previous eight years, has since retired; but we welcome a strong delegation from the Dutch East Indies, and amongst them their Vice-President, Dr. van Lonkhuyzen, and the General Secretary-Treasurer to the whole Association, Dr. Deggeller, both of whom so ably seconded de Vogel in organizing and conducting the fourth Congress.

At that Congress two important decisions were made. Firstly, touching the question of beriberi it was agreed that there is in the Far East an enormous annual loss of human life caused by deficient diet, and that this deficiency is mainly due to the over-milling of rice, which removes a vital part of the essential food factor.

It was the opinion of the Congress that beriberi could be controlled by substituting under-milled rice for over-polished rice in countries where rice is the staple article of diet.

The researches of Fraser, Stanton and others have proved that a satisfactory standard of milling was indicated by the presence on analysis of between four-tenths and 1 per cent. of phosphorus pentoxide in rice.

The fourth Congress, therefore, passed a resolution advising the appointment of a Commission on which all the countries concerned should be represented, to make recommendations as to the best methods for bringing beriberi under control.

To further this resolution, His Excellency the Governor has invited the Governments represented at this fifth Congress to authorize their official delegates to take part in a discussion on measure for the international control of beriberi, and has expressed a hope that delegates will be in a position to voice the views of their respective Governments.

It is hoped that, as a result, some commo effective line of action will be evolved.

Secondly, it was proposed at the Java Congress that a Quarantine Conference should be held at Batavia in 1922, with a view to securing uniformity of action in port health procedure at the various ports of the Far East.

Similar suggestions had been made by Brooks and others at former congresses, as the Paris Convention is not adapted to our needs.

The proposed Quarantine Convention was not, however, held at Batavia, because a better means of attaining our aim appeared.

The Health Committee of the League of Nations decided to despatch to the Far East a medical commission, with special experience of international public health agreements and of epidemic diseases of warm climate.

The defined objects of the mission were to collect information regarding the local incidence of epidemic diseases, and more particularly those of international importance, in the leading ports of the Far East, and to ascertain and study the measures which are taken, or are needed, from an international point of view, to prevent the transmission of these diseases to other ports.

The one member of the mission, Dr. Norman White, C.I.E., reached Singapore in December, 1922. During the next seven months he visited a number of important ports in most of the countries presented at this Congress, and consulted with their health officers.

While I must not anticipate his report, it will undoubtedly include proposals for a uniform convention amongst the Far Eastern countries to regulate port quarantine procedure, and for a central epidemiological bureau for the Far East. Here information regarding the prevalence of infectious diseases in our ports will be regularly collected, and quickly circulated direct to all the countries concerned.

You may perhaps agree that should such a bureau be established, Singapore would be a central station for it.

Dr. White's opinion that provision for the disinfection of ships should be made at the port of departure, rather than at the port of arrival, is sound.

Dr. White also drew attention to the scheme of a Health Committee of the League of Nations for a temporary interchange of the sanitary personnel of various Governments.

A number of health officers from various European countries were brought together in Brussels last year, where for a period of three weeks they attended lectures by experts of international standing, and where they saw the working of the public health machinery of Belgium.

They then dispersed to various countries, other than their own, where, for the remainder of a period of three months, opportunities were given them for obtaining inside knowledge of the working of public health administration.

At the end of that period they met again, compared notes, and departed for their own countries.

Dr. White expressed his opinion that the League of Nations Health Committee might arrange such a course in the Far East every second year, and might contribute towards the expenses thereof.

I propose that we consider this suggestion, and that, if the League of Nations and our Governments agree upon it, the first course might begin the venue and during the meeting of our sixth Congress two years hence.

An invitation from the Japanese Government to hold that Congress in Tokio has been conveyed to our Council by Dr. Miyagawa, leader of the very representative Japanese Delegation to the Singapore Congress. I feel no doubt that our full meeting at the close of this week will accept this invitation from the stronghold of science in the Far East, the land of Kitasato, discoverer of the plague bacillus.

Herbert Spencer wrote: "To be a nation of good animals is the first condition to national prosperity."

The requisites of personal health are well known: Adequate food, light and air, shelter, cleanliness, exercise and elbow room.

All our Eastern countries contain crowded cities, and in these cities a large proportion of the poor live in crowded slums. How is health possible when men, women and children lie down to rest huddled in airless rooms—rooms where consumptives, made tuberculous through this very overcrowding, spit on the floors, and pawing infants introduce infected sputum into their mouths? In some of these slums when the floors are full, human beings pay one quarter of their monthly earnings to sleep on shelves tier above tier in dark passages. In these slums where a single bath and latrine, often contiguous to the kitchen, are used by thirty or forty people, cleanliness is impossible.

Most large cities have in the past grown up without law or order: year by year more people have pressed into them. The remedy is clear—town planning, zoning, the building of enough houses in new residential areas to relieve overcrowding; the provision of cheap transport to enable the poor to live in these areas, and to travel to and from their work; modern sanitary arrangements.

These measures must precede the destruction or reconstruction of old insanitary tenements and the provision of playgrounds.

Starvation is not uncommon in the tropics. More malnutrition results from the use of improper food and badly prepared food than from lack of food. The three great deficiency diseases, beriberi, scurvy and rickets, are all preventable by proper diet, plus sunlight in the case of rickets. The sun is a prime preventive and remedial agent not only of tuberculosis but of other diseases. The heat of the sun is Nature's antiseptic. But into many tenement houses the sun never shines.

The prevention of dental decay will avert the majority of digestive troubles to which flesh is heir. Here again food is an important factor; the formation of the temporary teeth, being determined before the child is born, is influenced by the mother's diet.

In Malaya the rural population, amongst whom under-milled rice is the staple food, and breast-feeding is almost universal, have good teeth. Amongst city dwellers, many of whom eat over-milled rice, or over-milled wheaten bread, and whose babies are often bottle-fed, a sound head of

teeth is the exception. Medical inspection of schools here during the past two years discloses that nearly two-thirds of school children in Singapore city are suffering from serious dental decay, while the proportion in our rural schools in Province Wellesley is under 5 per cent.

Our large Eastern cities need pre-natal clinics, maternity hospitals, training centres for midwives, post-natal clinics, child welfare activities, dispensaries and sanatoria for the tuberculous, venereal clinics, school and dental clinics. But what will these avail unless we remove the sources of evil—overcrowding and bad feeding? Good housing is a powerful agency in the suppression of that scourge of mankind—plague. In Assam the moving of inhabitants from infected houses to new quarters has greatly aided the diminution of kala-azar.

This remark leads me to mention two diseases commoner in rural areas than in towns: First, there is malaria, the pest of the tropics, and not unknown in temperate climates.

Let us acclaim Ronald Ross, who twenty-five years since worked out the mosquito theory propounded to him by Manson, to a triumphant conclusion—rendered possible by Laveran's discovery of the parasite eighteen years previously. Ross's achievement revolutionized life in the tropics. It was perhaps the factor which determined our great colonial administrator, Joseph Chamberlain, to initiate a forward health policy in the British Colonies, and it led to the establishment of the London and Liverpool Schools of Tropical Medicine. There is still much to learn of this disease, but the day will come when it will be as rare in many parts of the East as yellow fever now is in most parts of America. Its prevention will be discussed at our Malarial Symposium under the chairmanship of Dr. Malcolm Watson.

Next comes ankylostomiasis, with which almost every Indian immigrant to Malaya and a great proportion of our Chinese and indigenous rural population are infected. Years ago Stiles, the American zoologist, working in the Southern States of America, preached not only the cure of ankylostomiasis by drugs, but the eradication of its cause, the hookworm, by simple improvements in rural sanitation. His proposals attracted the attention of that great man, now, alas! no more, Walter Page. Page brought Stiles' work to the notice of Flexner, Director of the Rockefeller Institute.

This led to the incorporation ten years since of the Rockefeller Foundation, and the organization of its International Health Board for the promotion of international hygiene. Funds were provided for a hookworm campaign, not only in America, but throughout the world. Following Gorgas' work, the Board has almost eradicated yellow fever in American countries, and has greatly lessened malaria.

It is giving financial help to needy countries, and to the League of Nations, for the training of health personnel.

The Foundation assists many medical schools. Its recent endowment of a Public Health School in London is known to all. The Pekin College of Medicine is its offspring, the Hong-Kong Medical College a recent foster child. It is furnishing scientific equipment and medical literature to many institutions, and especially in countries that have suffered most through the Great War.

We have with us to-day a Rockefeller delegate, Dr. Sawyer, who for the past four years has, in collaboration with Australian health officers, been organizing forces to exterminate the hookworm from the Continent of Australia. He will be one of the leaders of our discussions on beriberi and ankylostomiasis in this Congress.

The histories of malaria and hookworm illustrate the principle on which preventive medicine is based—the application of research to the problems of disease. The earliest and most successful instance falls only indirectly in this category. I refer to Jenner's epoch-making discovery of vaccination against smallpox, which has saved millions of lives, and has preserved the beauty of countless fair women. That great Frenchman, Louis Pasteur, by discovering and by teaching that disease was due to germs, laid the foundations of modern medical research.

Cinchona bark was used as an empirical cure for malaria for hundreds of years. During the saprophytic period drainage directed to improving cultivation had banished malaria from many regions. But it was not until the men of science took a hand that a rational scheme of action to prevent malaria everywhere, and under all conditions, became possible. The malarial parasite is discovered, its life-history is traced, the mode of transmission of infection is found by research. Next a number of earnest disciples, some of whom are in this theatre to-day, concentrate on the multifarious details that lead to prevention. They discover the various species of anophelines that carry the disease, classify them, study their habits, and consider the varied problems of destroying their breeding grounds—when to dam the sea out of a brackish marsh—when to encourage its entrance—when to drain a swamp—when to leave it untouched—when to fell the jungle—when to preserve it carefully—when to interfere—when to let well alone—what type of drainage suits which locality? In every case the cost must be counted, for neither Governments, companies, nor individuals wish to spend money needlessly, nor without an adequate return. Each outbreak of the disease is investigated and traced to its source. For if prevention is to succeed we must get at the *fons et origo mali*.

The work of Manson and Ross illustrates another fact, that we learn best what we teach ourselves. Manson, the father of tropical medicine, acquired scientific methods, and made his observations on the transmission of the blood worm, filaria, to man by the female mosquito while he was a busy general practitioner in China. Ross had little knowledge of mosquitoes or their anatomy when he started to reveal the mysteries of malaria.

taught himself. Several times he was transferred to official posts in which it was impossible to continue his researches. But he struggled back to his chosen course, and he headed again for his mark until he had attained it.

The discovery by a brilliant band of American observers that yellow fever was also a mosquito-borne disease, and the methods of its prevention, followed.

I will not weary you by multiplying examples of the steps in the prevention of disease—first, the discovery by research workers of the infective agent and of the means of its spread, then the development of methods of control.

The great group of bowel diseases, the diarrhœas, the typhoid group, the dysenteries, and cholera, checked by a pure water supply and good scavenging; the research work proceeding in India, the prevention and cure of such varied diseases as plague, leprosy and kala-azar; the diffusion of knowledge on venereal diseases, and their prevention; the success in the rural areas of the Dutch East Indies, and of Malaya and the Philippines of the campaign against another spirochætal disease—yaws, all these can only be mentioned in passing.

I will put you one question for reflection: What is the cause of the increased prevalence of cancer in Europe? What must we do to prevent this disease becoming more common in the tropics?

For the widespread practice of prevention an educated public, co-operating with an educated medical profession, is required.

Because of the numerous applications of preventive medicine in infectious disease, non-infectious disease and surgery, the British General Medical Council has recommended in its new curriculum 'that throughout the whole period of study the attention of the student should be directed by his teachers to the importance of the preventive aspects of medicine.' Sir George Newman, Chief Medical Officer of the British Ministry of Health, in his latest memorandum on "Recent advances in medical education in England," writes: "The part of preventive medicine should animate all teaching to students and be illustrated in the treatment of cases. In fact, it is not so much a separate subject of the curriculum that is required as a pervading influence, an attitude of mind, permeating and guiding all clinical study and practice." The purpose of medical education is therefore inherently altered. Its main object now is prevention, and when that fails, cure. But do not mistake me. It is not intended to exalt the specialist health officer above his fellows in curative medicine. We are all members of one body. We are taught in the Bible—and I doubt not that there is similar teaching in the Holy books of other religions—that each of the many members of one body, the hand, the foot, the ear, the eye, and so on, has need of the others; none is greater than the other, each is dependent upon all the rest; so, too, with the great body of medical men and women in every branch and of every nation.

I do not envisage the establishment of a huge army of specialist health officers. We undoubtedly need a corps of such officers to deal with special problems, to initiate and superintend schemes, to work in important centres, to discover right methods, and to train the men, whether medical or lay, who are to carry out these methods. But the mainstay of prevention in rural districts must be the country practitioner, the rank and file, the P.B.I. of our profession, who is public health officer, physician and surgeon, family friend and confidential adviser all in one. In passing it may be added that the would-be whole-time sanitarian should practise curative medicine before he embarks on his specialist course; and that, if he is wise, he will always retain his interest in curative medicine.

I am glad to see here to-day, in addition to the Director and several other members of our own Education Department, the Hon. Mr. E. A. Gilmore, Vice-Governor of the Philippines, and Chief of the Departments of Public Instruction and Health in those islands. The education of public opinion must begin in the elementary, and must continue in the higher school. In this country a simple book, written in the Malay language by Dr. Winstedt, and conveying lessons of personal and public hygiene, is in use in our vernacular schools. Science is now a subject in our local English schools; in addition, our teachers are lectured in tropical hygiene by health officers, so that they may be qualified to pass on elementary instruction to their pupils of every race. In time this will become more advanced.

In many tropical countries the death-rate is double that in temperate climates. The death-rate in England has fallen to 13 per thousand, the infantile mortality rate to 77 per thousand (and in the families of medical men to under 40 per thousand). This sets a standard at which to aim. There is nothing inherently unhealthy in a tropical climate; and there is no reason why these figures should not be approached if public opinion is enlightened and organized.

The press, and especially the daily press, is a great power to arouse a public health conscience. That power is at our service. Each individual should learn how to keep fit and how to avoid disease. Man is a combative animal. Let every man, woman and child make war on disease and its carriers; be rough on rats; and give no quarter to flies and fleas, mosquitoes and lice, the insect carriers of infection. Let personal cleanliness, and all it stands for, be taught and practised by all. So may we realize not only the union of the medical profession of the Far East, and the promotion of friendly international intercourse between physicians, but a greater union of every nation, East and West, to substitute for strife between men a peaceful rivalry in the pursuit of health.

Salus populi suprema lex!

Abstract.

THE INTRAVENOUS THERAPY OF
RHEUMATOID ARTHRITIS.¹

By H. LAURIE, M.D.

DURING the past eighteen months we have treated at the Alfred Hospital fifty-six patients with non-suppurative infective arthritis by means of intravenous injections of *Bacillus coli communis* vaccine. This is one form of what in medical literature of recent years has been called "non-specific" intravenous protein therapy. This term, however, is not only cumbersome, but probably incorrect. Professor Nolf, who introduced peptone as a therapeutic agent eight or nine years ago, found that substances other than proteins caused an exactly similar reaction, including metals in colloidal form. He suggested that the reaction which followed the injection was due to changes in the colloidal equilibrium of the blood. However this may be, it is well known that various substances—colloidal metals, peptone milk or various preparations of milk, bacterial vaccines and so on—when injected all give the clinical reaction in question.

Of these peptone has been almost universally used for this purpose in many and varied conditions from ununited fractures to epilepsy, as mentioned by Herbert French. Peptone injections, however, are not without danger. Peptone as at present procurable is a variable product containing various proportions of primary and secondary proteoses and a variable number of by-products of which, according to A. G. Auld, the most important is histamine. The presence of this substance is probably responsible for the terms "protein shock" and "peptone shock," so often used to describe the reaction obtained.

Whole milk cannot be given intravenously because of the danger of fat embolism. Thus various preparations containing casein have been prepared. Of these we have had no experience.

We have used "T.A.B." vaccine in all our cases of typhoid fever, as advocated by K. D. Fairley, with excellent results.

BACILLUS COLI COMMUNIS VACCINE.

In our cases of arthritis, as well as in other cases, such as colitis, pyelitis, &c., at the Alfred Hospital, we have always used *B. coli communis* vaccine. This is always procurable and is undoubtedly safe, provided certain precautions are observed. The only conditions in which I would hesitate to use it are pregnancy and the presence of actual cardiac failure. For a first injection the patient should be given an aperient the night before, and a light diet on the day of the injection to minimize the nausea and vomiting which sometimes occur. The patient

must be put to bed and kept in charge of a nurse until the reaction is over.

Dose.

The initial dose should not be more than twenty-five million bacilli. In subsequent injections the doses should be increased. Our largest dose has been twelve hundred millions, though even in the same patient the intensity of the reaction is by no means commensurate with the dose employed. In many cases after large doses have been given smaller doses have resulted in just as good reactions. If the patient has a definite toxæmia which seems to modify and inhibit the reaction, a larger initial dose may be administered.

We always used a stock vaccine in which, as a rule, 1 minim (0.06 c.c.) contains about ten million bacilli. This we inject undiluted, though it may be diluted with normal saline solution if preferred. Owing to the small bulk of the dose of undiluted vaccine, I personally use a tuberculin syringe which is graduated in minims and hundredths of a cubic centimetre. A fine rather short needle is an advantage.

Technique.

The technique of the injection is simple. The bend of the elbow is prepared in the usual way with spirit, and then lightly painted with tincture of iodine. A length of rubber tubing or even a handkerchief is applied above the elbow sufficient tightly to distend the veins. This secured in a way to be easily released. A prominent vein is chosen and the needle, attached to the syringe, already sterilized and charged with the required dose, is inserted into the vein. The tourniquet is then released and the contents of the syringe injected rapidly into the vein. No dressing is required. Care must be taken not to inject any air. For this reason a glass syringe is a necessity.

The Reaction.

The reaction of the human organism to this treatment is somewhat variable. The typical reaction which it is desired to obtain is initiated from a half to one hour after the injection by sharp rigor lasting from twenty to thirty minutes. This is accompanied by a rise of temperature reaching a maximum of 39.4° C. (103° F.), even 40.6° C. (105° F.), or 41° C. (106° F.). This is followed by a rapid fall with profuse perspiration. Within twenty-four hours the temperature is normal or subnormal, even in patients who were febrile prior to the injection. The patient always complains of more or less headache, usually, however, of short duration. In many cases there is some nausea and vomiting.

Atypical reactions are often seen, the most common being those in which the reaction is a patient with slight nausea and headache, but with little or no rigor or rise of temperature. These often occur when least expected, and are common in patients with distinct toxæmia. In some persons after a good reaction there is a delay in defecation.

¹ Abstracted from the *Medical Journal of Australia*, vol. i, No. 12, March 24, 1923.

cence, the temperature not reaching normal until thirty-six or forty-eight hours after the reaction. Again, there may be a double reaction on successive days, with, as a rule, a slight fall of temperature between. More rarely the reaction may be delayed for from eighteen to twenty-four hours. Atypical reactions are much more common after first injections, later reactions tending to conform to the typical. Some of these forms of reaction may be identified in the charts of the cases to be described later.

THE NATURE OF RHEUMATOID ARTHRITIS.

Before discussing our results it is necessary to define clearly what is meant by the term rheumatoid arthritis. Under the heading of *Arthritis deformans* Osler and Macrae include what in my opinion are two separate conditions, one in which the synovial membranes and the peri-articular tissues, and the second osteo-arthritis, in which the cartilages and bones are primarily involved. For the former of these forms, for want of a better name, I have used the term rheumatoid arthritis, a name sanctioned by usage. As infection invariably plays an important rôle in the etiology of these cases, the term infective arthritis is often employed. This, however, would include suppurative and other forms of arthritis not included in rheumatoid arthritis. In the early stages of rheumatoid arthritis for varying periods there is no involvement of bone or cartilage beyond some loss of density of the heads of the bones adjacent to the affected joints. Later there is erosion of both bone and cartilage, and later still outgrowths of bony substance in an effort of Nature to immobilize disorganized joints. In this chronic stage acute exacerbations are common. Rheumatoid arthritis usually has its beginning between the ages of 20 and 40.

On the other hand, the hypertrophic form—osteoarthritis—rarely, if ever, begins before the age of 40, is chronic from the onset, is never acute, and as a rule steadily progresses. In a few cases we have found peri-articular and synovial involvement probably due to a superadded rheumatoid condition. It is doubtful whether bacterial infection plays any part in an uncomplicated case of osteo-arthritis.

ACUTE RHEUMATOID ARTHRITIS.

In the acute group the really acute cases of only a few days' duration have been included, and also others of somewhat longer duration, up to six weeks, with no bony changes or peri-articular fibrosis. Several of these patients were admitted with a provisional diagnosis of rheumatic fever, and it was only when they failed to respond to large doses of sodium salicylate that a correct diagnosis was made. In all these patients the recovery from the attack was more or less rapid and complete, and the patients were finally discharged without any disability. Three of them required one injection only. The maximum number of injections was seven, the average number being three and a half.

SUBACUTE RHEUMATOID ARTHRITIS.

The subacute group includes two types of cases, those that begin insidiously, as many do, with no acute stage, and those which begin acutely, but subside, leaving more or less peri-articular thickening and limitation of movement, but still no discoverable bony changes. This was verified in several cases by skiagrams. Of the eleven cases in this group eight cleared up entirely. Three patients could be classed as merely improved. In these pain was banished, but there remained a certain amount of stiffness of the joints with some limitation of movement due to persistent peri-articular fibrosis. In all, however, the range of movement was appreciably increased.

CHRONIC RHEUMATOID ARTHRITIS.

The group of chronic cases contains fifteen patients, in whom there was either fibrous ankylosis of joints or definite bony changes, with, in addition, more or less acute or subacute synovial and peri-articular involvement. These all improved in so far as pain, stiffness and range of movement were concerned, the acute and subacute conditions clearing up. The bony changes and deformities, as was to be expected, were not visibly influenced by the treatment. The routine in these cases, as well as in the more resistant among the acute and subacute cases, has been to give a preliminary series of injections. As soon as the patients were able to move about with comfort they were sent home, but were required to return once a week for further injections, being kept in hospital on these occasions for one night only. Many of the patients who came in for weekly injections reported an increasing period of freedom from pain after injection, at first one or two days, until later there was entire freedom from pain for the whole week. In the chronic cases an average of fourteen injections were given, as against seven in the subacute cases.

VERY CHRONIC RHEUMATOID ARTHRITIS.

The very chronic group includes eight persons with fibrous ankylosis of joints and bony deformities in whom little improvement was possible. In only one of these, however, could it be said that there was no improvement.

OTHER FORMS OF ARTHRITIS.

Possibly the non-articular cases should not be included in this series. In these there is always bony involvement from the beginning. They belong rather to the osteo-arthritis division. The intravenous method of treatment has been used in a few cases of uncomplicated osteo-arthritis with little or no result.

The gonorrhœal cases are included as a reminder that they are very amenable to treatment by this method, improvement being much more rapid than when treated by gonococcal vaccine by subcutaneous injection.

DISCUSSION.

From the above cases, shorn of all details irrelevant to the method of treatment under discussion, it must not be inferred that old and proved methods were not employed when they were required. The rapid results obtained by this method did not do away with the necessity of searching diligently for possible foci of infection in teeth, tonsils, nasal sinuses, uterus and its appendages and elsewhere. If such be found they must be treated adequately with a view to the prevention of further attacks. Then, again, mechanical appliances to correct deformities are necessary in many of the chronic cases. Massage and hot air are also of considerable value.

There is one form of treatment, however, which it is thought will be superseded in these cases by the intravenous method, and that is the use of autogenous vaccines administered subcutaneously. Vaccine treatment in the past has been in most cases very disappointing. In many cases it is impossible to discover any focus of infection. Even when an autogenous vaccine can be prepared, in many cases its administration in increasing doses gives little or no reaction. It presumably does not contain the causative organism. At times a large dose of an autogenous vaccine is given, in view of previous disappointments, and an intense reaction follows, with marked focal exacerbations of pain and swelling in the affected joints. As this subsides the treatment is continued; even in these circumstances the final results are not always perfect, even in acute cases. Contrast this with the results of treatment by the intravenous injection of *B. coli communis* vaccine.

In not one of these patients was there any increase of pain, unless occasionally and temporarily during the rigor, but soon afterwards, and certainly within twenty-four hours in all but the most chronic cases, there was distinct amelioration, if not absence, of pain. These results were also obtained much more rapidly than was ever seen by the old method.

Prior to the initiation of this treatment, patients suffering from rheumatoid arthritis were not enthusiastically welcomed in the beds of the hospital, as their stay was always prolonged far beyond the average period. Now at the Alfred Hospital all that has changed. The stay in hospital for a preliminary series of injections is always comparatively short, usually only a few days; and in the case of patients who return for subsequent weekly injections, the detention is for one night only.

In support of the safety of this treatment it is only necessary to point out that in this series four hundred and seventy-six injections were given, and in only one case were there any alarming symptoms. In this case there were cyanosis and dyspnoea at the height of the reaction. The patient was relieved of his arthritis, but died several weeks later of uræmia. Old age is no contra-indication. The oldest patient was 77 years of age, and was

crippled and had been confined to bed for some weeks. She was put on her feet again and is still well.

There has been no attempt to discuss the many problems that this treatment suggests. As to its mode of action in the present state of knowledge all that can be said is, as Peterson expresses it: "That this method is purely one of stimulation, whereby the forces of cellular and humoral resistance are for a short time keyed up to the very highest pitch."

Annotations.

An Epidemiologic Study of Hookworm in a small Village on the North Coastal Plain of Porto Rico (W. W. Cort, W. A. Riley, G. C. Payne and R. B. Hill, *American Journal of Hygiene*, vol. iii, July Supplement, 1923).—An epidemiologic study was made of a small village on the north coastal plain of Porto Rico, which had been practically uninfected by treatment work, and where latrines had been present only one year.

In spite of less favourable natural conditions for the development of hookworm larvæ, the egg output of forty representative individuals in this area showed a very high index of infestation, as compared with other areas in the mountain regions of Porto Rico, where more treatment work has been carried out.

A survey of the conditions of soil pollution in this area showed that all the latrines were in some degree of use, and at only a few places was there any concentrated soil pollution.

Significant centres of soil infestation had developed in polluted areas in the yards of only six of the twenty-five houses visited.

Infective hookworm larvæ in the soil were found to withstand a period of almost two weeks of gradual drying of the soil in shaded places.

From several places, later examination showed that all soil infestation had died out after a period of six weeks.

The production of new soil infestation at a house, where three hookworm-infested individuals had moved in, after the treatment campaign had been completed, indicated a source of danger of re-infestation in controlled areas at those houses where people failed to use the latrines.

Tryparsamide in Sleeping Sickness (C. C. Chesterman, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. xvi, No. 7, 1923).—The author tried some experiments with tryparsamide in cases of sleeping sickness with the object of testing the results of the administration of large doses by intravenous injections at weekly intervals. The following conclusions were arrived at:—

The maximum tolerated dose (which should not exceed 4 grm. per week for the full-sized adult),

f given regularly for a period of about eight weeks is capable of completely removing trypanosomes from, and rendering within the normal, the cell content of the cerebro-spinal fluid of even the most advanced cases.

This change in the cerebro-spinal fluid is accompanied *pari passu* by a very marked clinical improvement, which has so far been observed to have been fully maintained for periods not exceeding eleven months, the longest time which has elapsed up to date since treatment.

It is possible to estimate the maximum tolerated weekly dose from a consideration of the clinical condition and cell content of the cerebro-spinal fluid of the patient, so that these results can be obtained without danger of producing any appreciable degree of visual disturbance.

Improvement is hardly less marked in cases which have previously resisted treatment by other arsenical drugs.

The intravenous method of administration is superior to that of intrathecal serum therapy.

Sprue in Queensland (S. M. Lambert, *Journal of the American Medical Association*, vol. lxxx, No. 26, 1923).—The author describes his own attack of sprue which occurred in 1919 while he was in Queensland. Treatment consisted of hydrochloric acid and pancreatin administered in doses of 15 minims of 0.2 per cent. hydrochloric acid before and 10 gr. of pancreatin after each meal; no dietary precautions being taken whatever. The results were most successful, and this treatment has now been adopted along the entire coast of Queensland.

Investigations on the Control of Hookworm Disease (D. L. Augustine, *American Journal of Hygiene*, vol. iii, No. 4, July, 1923).—Laboratory and field experiments were performed testing the factors which influence the length of life of infective hookworm larvæ.

In moist soils in Porto Rico, a few infective hookworm larvæ lived for eight weeks in deep shade and six weeks in light shade. Under direct sunlight an almost complete dying out occurred within five days.

Infective hookworm larvæ were found to die rapidly on water-covered soils. The early death of the larvæ is associated with the presence of fungi, bacteria and protozoa.

In drying soils, in dense shade, a few mature larvæ were recovered one month after the experiment was started. In light shade, when evaporation of water was rapid, all were dead after about twelve days.

The alternating drying and moistening of soils hastens the death of hookworm larvæ.

Temperature has an important bearing on the length of life of mature hookworm larvæ. At 27° C. over 99 per cent. of the original number of larvæ perished after nine weeks; at 35° C. all were dead within three weeks. When larvæ are exposed to cooler temperatures, 15° C., the rate of reduction is considerably less than at 27° C., and their length of life is longer. 0° C. was found to be unfavourable for

the existence of infective hookworm larvæ and they perished within one week.

Soils with vegetation are more favourable for the development and life of infective larvæ than soils without vegetation.

Environments exposed to the direct sun of the tropics are unfavourable for hookworm development, and the few larvæ which reach maturity die within a few days.

Dense shade affords an optimum environment for the development and continued existence of mature hookworm larvæ. Approximately 0.6 per cent. of the original number of infective larvæ were recovered nine weeks after the deposition of a stool, from an infected individual, upon the soil.

Washing of the soil by heavy rains and the drying of the soil, under field conditions, are important factors in reducing soil infestation.

Treatment of Plague with Iodin (P. Gupta, *Indian Medical Record*, June, 1923).—Out of 503 persons inoculated with plague vaccine nine were attacked with the disease, out of which two died, owing to the fact that they received the preventive inoculation too late.

Treatment consisted of intravenous injections of tincture of iodine, 10 c.c. of a 10 per cent. aqueous solution; brandy, musk, &c., internally, and belladonna locally for the inflamed glands.

Study of Hookworm in the Mountains of Porto Rico (W. W. Cort, W. A. Riley and G. C. Payne, *American Journal of Hygiene*, vol. iii, July Supplement, 1923).—The area in which these studies took place has been under the influence of hookworm control work for about twenty years. About half the houses were satisfactorily sanitized, and the average egg output for the 111 people examined was 1,050 eggs per gram, which was by far the lowest for any of the areas studied in Porto Rico.

The conditions around most of the houses were unfavourable for the development of hookworm larvæ, and very little soil infestation was found, so that the conclusion can be drawn that under the present situation, in Area B, very little hookworm infestation could be obtained near the houses.

The comparison of the situation in Area B. with that in Area C., where there had been practically no influence from control work, emphasizes the important results which have come from the hookworm control work already carried out in Porto Rico.

Tropical Sprue (D. N. Silverman and W. Denis, *Southern Medical Journal*, July, 1923).—The authors made several observations with regard to tropical sprue and its relationship to disturbances of the pancreatic digestion. The enzymes of duodenal contents were present to a considerable extent during the clinical course of the disease, and these enzymes increased in strength during clinical

improvement of the case, seeming to indicate that in tropical sprue the pancreas does not always undergo extensive or permanent damage, and that this gland may assume its normal digestive function.

Oriental Sore in the United States (R. A. Lambert, *Journal of the American Medical Association*, vol. viii, April, 1923).—The author describes two cases of cutaneous leishmaniasis occurring in immigrant Armenian children. One of the cases involuted spontaneously after a year, the other was treated by excision and Röntgen-rays with successful results. It is suggested that biopsy be made for diagnostic purposes, as the organism is more easily found in stained tissue than in smears.

Melanoma of the Lower Lip (E. W. Netherton, *Archives of Dermatology and Syphilology*, vol. viii, No. 3, September, 1923).—A case of melanoma of the lower lip occurring at a very early age is reported.

Although histologically the tumour was a melanoma, clinically it could not be differentiated from sarcoma. The lip is not a common site of the origin for sarcoma, only a few cases being on record.

The rapidity of growth following Röntgen-ray therapy was characteristic of melanoma, although Montgomery and Culver have reported a case of melanoma of the lip in which favourable results followed radium therapy.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 8, August, 1923.

Some Observations on Dysentery (J. Cunningham).—The author discusses two types of dysentery—jail or institutional dysentery, which is due to a bacillary cause and has a special epidemiology of its own; and the dysentery found in the civil population, which varies considerably in severity and is considered to be most commonly amebic in origin. In 1912 this view of there being two types of dysentery was widely held, but the author is of the opinion that there is no such thing as a dysentery peculiar to jails, the type found inside and outside the jail being one and the same. This being the case, the true ratio of frequency between bacillary and amebic infections in India can be best obtained from jail statistics, which show that both types of the disease occur in endemic areas, and that the relative frequency of the bacillary type is far greater than that of the amebic.

The author deals in turn with acute or fulminating dysentery, subacute, chronic and latent dysentery,

and advocates a systematic macroscopic examination of stools as a really practical means of dealing with the carrier problem.

The "Aldehyde Test" in Malaria (R. B. Lal).—The aldehyde test, as used by Napier, is not positive in malaria if the standards of this author be taken. There occurs, however, in some persons infected with malarial parasites a definite opacification, but to a much less degree.

No relation can definitely be made out between the clinical and pathological conditions, viz., size of the spleen or of the liver and the temperature and the slight reaction that takes place in some of the cases. No relation could be found between the urine tests employed and the aldehyde reaction.

The Possibility of Latent Infection with Bacillus typhosus (J. W. Cornwall).—The author is of the opinion that it is possible for a man to be infected with *Bacillus typhosus*, and to show little or no signs of illness even after the usual period of incubation. Yet the bacilli may be lying latent in foci somewhere in his tissues, liver, spleen, gall-bladder, bone-marrow or elsewhere, and in course of time his resistance is overcome by the continuous absorption of small quantities of toxin. Then the bacilli multiply and spread, and a recognizable attack of typhoid follows. It is a thing almost incapable of proof, but it is a possibility which it may be useful to bear in mind.

Streptococcal Affections of the Skin (U. N. Mandal).—The author made a study of the streptococci infecting the skin in the Pathological Laboratory of the School of Tropical Medicine. The investigations are not yet complete, but the following conclusions were arrived at:—

That hæmolytic strains are more virulent than the non-hæmolytic ones.

That most of the streptococci isolated from the chronic cases do not cause death in rabbits by septicæmia, but the animals die after a period of ten to thirty days from arthritis and diarrhoea.

The lactose fermenting character is associated with vesiculation and weeping, suggesting that the irritation produced on the vessels and the resultant increased capillary permeability of the condition may be due to the production of end products such as lactic acid.

Staphylococcus aureus and *albus* grow symbiotically in eczema and do not hinder the streptococci, this explaining their almost invariable occurrence in this disease.

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Original Communication.

SOME OBSERVATIONS ON PLAGUE IN BAGHDAD, WITH A PLEA FOR THE ROUTINE USE OF THE SPECIFIC ANTITOXIC SERUM IN TREATMENT.

By T. BARRETT HEGGS.

ANCIENT HISTORY OF PLAGUE IN ARABIA.

In the Old Testament of the Christian Bible, I Samuel, v and vi, a severe epidemic is recorded, characterized by "tumours," which affected the Philistines. Five golden images of these tumours and five golden mice were sent as a trespass offering along with the returned Ark—the mice "defiled" the land—that is, probably died in great numbers at the same time as the human outbreak, and is consistent with our present experience of plague. I therefore seem fairly certain that this was an epidemic of bubonic plague, which occurred in Palestine about B.C. 1141, that is 3,000 years ago. According to Hirsch, plague occurred in Syria about B.C. 200. Certainly in A.D. 850 the Persian physician, Ali Ibn Rabban of Tabaristan, who was in the service of the Caliph-el-Muta-Wakkil at Baghdad, wrote of plague in his famous work, "The Paradise of Wisdom" (Firdaws-el-Ilkmat). Part iv, Discourse li of this work treats of plague. This book was written at Baghdad, and therefore we may assume that the disease existed in these parts at that time, over 1,000 years ago (Professor E. G. Browne in his "Arabian Medicine").

A pandemic occurred in the eleventh century, increasing up to the fourteenth century, and then declining till, in the seventeenth century, it left Western Europe, and in 1884 it left Eastern Europe and Asia Minor, remaining however in Assyria, in Western Arabia, south-east of Mecca. In this pandemic London suffered to the extent of 70,000 deaths in 1665. During this period, however, from the eleventh century plague is said to have been epidemic in India, and has continued to be so up to the present time. It was known in China in the eighteenth century. The pandemic of 1898-1907 spread originally from India and Arabia again was affected.

In the 1913 edition of Castellani and Chalmers the area of the Kurdistan Hills is classed as an endemic region with a secondary area in Iraq. What the evidence of endemicity there was is not stated.

PLAGUE IN IRAQ FROM NINETEENTH CENTURY TO DATE.

This disease has entered Iraq: (1) most often by way of the Persian Gulf and Basrah in 1899, 1901, 1905, 1907, 1910, 1911 and 1912. For the most part on these occasions the disease was mainly localized to Basrah and was limited to small epidemics.

(2) Rarely by way of the land frontiers either by way of Rawanduz and Sulaimaniyah as in 1831, by way of Badra and Mendili, as in 1884, or by way of Khanakin, as in 1834.

The disease was endemo-epidemic in some part of Iraq in 1867, 1873 to 1877, 1880 and 1881, 1892 and 1900.

PLAGUE IN BAGHDAD.

Baghdad was affected in 1831, 1834, 1873, 1875 to 1877, 1901 and 1902, 1908 and 1909. According to the British Consular reports severe epidemics of this disease occurred in the Baghdad area in 1892 and 1915. In the latter outbreak 1,700 cases occurred with 1,300 deaths.

From the British occupation of Baghdad in 1917 the plague history of this city is as follows:—

Epidemic	Cases	Deaths	Mortality per cent.
Nov. 1918 to Aug., 1919	871	674	77.2
" 1920	132	89	67.4
" 1921	57	47	82.0
" 1922	341	227	66.5
" 1923	451	275	61.0

I wish shortly to consider a few features of each of these outbreaks.

The 1919 Outbreak.

The first case, after British occupation, was in August, 1918, in the neighbourhood of the Sadriyah grain market. A rat epizootic was later found to exist in that area. Owing to disturbance of local agriculture by the war, grain at that time was being imported by river from Basrah. This grain came from India—Basrah had already suffered from plague each year from 1915, and Amarah on the river half-way to Baghdad had an epidemic in the spring of 1918. These facts pointed to the infection of Baghdad by the river from Basrah through the importation of grain. Previous to the occurrence, however, of human cases of plague, no systematic rat catching and examination had taken place in Baghdad, and so we cannot be certain that plague had not carried over among the rats from the epidemic of 1915. On the occupation by British Forces, on March, 1917, only one qualified local doctor remained in the city, so that it is possible that a few human cases may have occurred and were missed. In view of my experience of plague here in inter-epidemic periods since 1920, and the officially recorded history of plague here, I am inclined to the opinion that plague has been endemic in Baghdad for many years, and that its importation from Basrah in 1918 is not proven.

In this outbreak the disease first began to be epidemic in week ending February 21, when 13 cases occurred and ended in week ending June 27, when 9 cases occurred. The highest incidence was in week ending May 30, when 94 cases occurred.

While the gross mortality was 77.2 per cent., there were 214 cases admitted to Civil Isolation Hospital, of which 67 died—a mortality of only 31.3 per cent. Mortality of city cases 92 per cent. No serum treatment was used at that time. By May 30, when the epidemic reached its maximum, 82,558 persons had been inoculated with plague vaccine.

The uninoculated cases were 817 and their deaths 645 or 78.9 per cent.

Inoculated cases were 54 and their deaths 29, or 53.7 per cent.

Taking the average inoculated and uninoculated population separately the incidence of the disease per 10,000 population was: inoculated cases 9.5 per 10,000 and uninoculated 75.3 per 10,000 population. The protection conferred was therefore very definite both from attack and from mortality. I am indebted to the report of Major Taylor, I.M.S., for the figures of this outbreak.

Between the 1919 and 1920 outbreaks a completely free period of twelve months occurred.

The 1920 Outbreak of 132 Cases.

Again the first case occurred in the neighbourhood of the Sadiyah grain market in June, 1920. The disease, however, first became epidemic in October and ended early in December—132 cases in all occurred with 89 deaths, a case mortality of 67.4 per cent.—65 cases were treated in isolation hospital, of which 22 died (5 before admission to wards) with a mortality of 33.8 per cent. Anti-plague serum was not used; 47,000 persons were inoculated; only one inoculated person was affected: the mortality of city cases was 100 per cent.

The 1921 Outbreak of 57 Cases.

The outbreak was due to a carry over from the 1920 outbreak.

On February 10 the first case occurred in Sitta Hadiyah and the disease did not become epidemic till May, when 27 cases occurred in this month. The epidemic ended early in July but a few sporadic cases (six) occurred up to the end of the year. Seven hundred inoculations made only. No affected person had been inoculated within a year. Total number of cases 57, of which 47 died, a case mortality of 82 per cent. Anti-plague serum was not used; mortality of city cases 97 per cent.; 21 cases treated in hospital, of which 12 died, a mortality of 57 per cent.

1922 Outbreak of 341 Cases.

A few cases occurred in each of the winter months as a carry over of the 1921 outbreak and in April the disease became epidemic until the hot weather at the end of June arrived when the outbreak quickly declined.

Altogether 341 cases occurred, of which 227 died, a gross case mortality of 66.5 per cent.; 126 cases were treated at isolation hospital, and 35 died, a mortality of 27.7 per cent. Mortality of city cases was 89.3 per cent. This year anti-plague serum (Pasteur) was used at the city isolation hospital but practically not used in the city, a total of only 600 c.c. being used in the city. Inoculations 38,000. Only two persons inoculated less than six months acquired the disease and they both recovered. In the four years (1919-1922) a total of 168,258 plague inoculations have been made in the city. In 1919 alone 82,558 were done, so that we may assume at least 100,000 persons existed who had been inoculated once in the four years, yet in 1922 outbreak only nineteen persons affected had ever been inoculated and their mortality was 42 per cent.

Of the 150,000 not inoculated 322 cases, or an outbreak rate eleven times greater and mortality 68 per cent., as compared with 42 per cent.

The 1923 Outbreak of 451 Cases.

A few sporadic cases continued to occur during the colder winter months of 1922 and the disease again became epidemic in April, 1923, till early in July when it ceased rapidly. In all 451 cases occurred up to the end of July with 275 deaths, a gross mortality of 61 per cent. Of these 127 were admitted to hospital and gave 46 deaths, a mortality of 36.2 per cent. Of these hospital cases 23 were admitted *in extremis* and died within twenty-four hours, in fact 11 died within twelve hours and 5 within one hour of admission. Excluding these moribund cases the hospital mortality was 22.1 per cent. The mortality of the cases in the city was 70.7 per cent.

This year anti-plague serum was often given to home-treated cases, 11,800 c.c. being used by practitioners in the city and it was routine treatment in the hospital.

Forty-two thousand and sixty-nine persons were inoculated with anti-plague vaccine. Of these, 8 cases occurred with no deaths, as compared with 443 cases with 275 deaths among the 200,000 uninoculated population. One case inoculated seven months previously died, 4 cases inoculated one to two years previously had 2 deaths and 4 cases inoculated over two years had 1 death.

Analysis of the Hospital Cases in 1923.

The treatment followed was the injection of the specific serum subcutaneously in ordinary cases, intravenously in very toxic cases and in several cases by both routes—subcutaneously the amount given was 40 to 200 c.c. and intravenously 10 to 120 c.c. The average amount given on 108 cases was 73 c.c. Our frequent experience was that subcutaneous injection only gave temporary relief to symptoms but intravenous injection complete relief even in some of the unconscious moribund cases.

The classification of type was 56 per cent. inguinal bubo, 13 per cent. axillary, 13 per cent. cervical, 13 per cent. multiple buboes, 5 per cent. septicæmic.

No primary pneumonic case, though pneumonia occurred as a complication in some of the bubonic cases. The diagnosis was confirmed bacteriologically in most cases. The buboes usually suppurated. The mortality varied with the duration of the disease on admission, as shown in the following table:—

Day of disease on admission	Percentage of cases admitted	Case mortality per cent
1	Nil	Nil
2	1.5	Nil
3	9.4	16.6
4	13.4	29.4
5	17.3	40.9
6	14.1	55.3
7	11.8	53.5
8	8.6	36.3
over 8	18.1	21.7
Unknown	5.5	—

The mortality rises with each day of delay until the eighth day. By this time the more severe cases have

died at home. The figures call for early specific treatment. A case should be injected at once, and afterwards notified for removal to hospital.

AN OUTBREAK OF PNEUMONIC PLAGUE, 1923.

In February, 1923, an outbreak of pneumonic plague occurred in bedouins of the Beni Tamim tribe, who were grazing their sheep near Sumaicha, within about fifty miles of Baghdad. Some thirty cases occurred with only one recovery. The first case was bubonic, but developed pneumonia before death, all the remaining cases were purely pneumonic. The original case had visited Baghdad, where the infection was probably obtained. He returned to his tribe ill, at a time when a heavy rainfall had occurred, and the nights were cold. He coughed up blood before he died. All the other cases were contacts, who died after one or two days' illness of severe fever, prostration and coughing up of blood. Only one case was seen alive, he was typical, his sputum was a pure culture of plague bacilli.

The outbreak ceased on the segregation of this section of the tribe, removal of their camping ground and inoculation.

The outbreak was discovered on the bringing of the corpses to the holy city of Kazimain for burial. Pneumonic plague is rare in Baghdad. These were the first cases seen since British occupation in 1917.

INOCULATION.

The protection afforded by anti-plague vaccine is very definite, both against attack and against mortality. The following table shows this:—

Year	Total Cases	Uninoculated population	Cases among the uninoculated	Inoculated population	Cases among the inoculated population	Mortality among uninoculated	Mortality among inoculated
1919	871	167,442	817 or 1 in 200	82,558	54 or 1 in 1,530	78.9	53.7
1920	132	203,000	131 or 1 in 1,550	47,000	1 or 1 in 47,000	67.4	—
1921	57	249,300	57	700	—	82.0	—
1922	341	212,000	330 or 1 in 625	38,000	2 or 1 in 19,000	67.0	nil
1923	451	207,931	443 or 1 in 467	42,069	8 or 1 in 5,250	62.0	nil

The protection afforded after six months is shown in the following figures for the year 1922 and 1923:—

1922.—In this outbreak two cases only were affected, who had been inoculated within six months, and they recovered, but one case occurred who had been inoculated six months to one year, and he died. Eight had been inoculated over one year and under two, and case mortality was 50 per cent.; and eight had been inoculated over two years but under three, and their mortality was 37.5 per cent, as compared with a mortality of 68 per cent. among the uninoculated cases.

1923.—Here eight cases were affected who had been inoculated within six months, and they all recovered, but one case inoculated over six months and under one year died; four inoculated over one year and under two had two deaths, 50 per cent.; four inoculated over two years and under three had one death, 25 per cent., as compared with a mortality of 62 per cent. among the uninoculated.

Under the 1922 outbreak I discussed the protection of the inoculated against attack, and showed that the attack rate is distinctly lower among the inoculated even after two and three years. In any case I consider that the above facts point to some protection lasting from inoculation longer than six months.

THE RÔLE OF RATS.

The *Mus rattus* is the plague-affected rat in Baghdad, and the evidence is that this rat and its flea play the same important rôles of originator and vector of plague here as in other countries. A rat epizootic is always present during a human outbreak, and a heavy rat mortality from plague is always followed by a serious human outbreak. The first indication, however, of the approach of an epidemic has not always been a rat epizootic, but the occurrence of a human case, after which intensive rat trapping discovers the existence of the disease among the rats. Rats affected with plague have been found in small numbers throughout the inter-epidemic periods. An epizootic among the rats in an area is not always followed by human cases. Inoculation is of course carried out at once in such areas. The incidence of plague among rats caught or found dead falls about two to three weeks previous to the fall in human cases. A plague of fleas in the houses, and warehouses and offices was an indication of serious import in the beginning of the 1923 outbreak. Climatic conditions favourable to the ordinary flea being evidently also favourable to the rat flea.

For the elimination of human plague rat epidemics in the city must be prevented. No practical means of destroying the rats have yet been devised. The

protection of the people by driving the rats from the dwellings is difficult but not impracticable. Building regulations put into force gradually, better protection of food supplies and of house refuse from rats are necessary.

The protection of the people from the access of rat fleas to them is necessary, together with the former measures, and this involves a change in the habits of the people as to being barefooted in the house or of wearing shoes without stockings, of squatting on the floor and of sleeping on the ground.

TREATMENT.

The Indian Plague Research Commission, 1906-1908, studied this question in Bombay. They showed that in 58 per cent. of the cases there is a septicæmia which may be present early in the disease and which progresses up to death but sometimes is fluctuating and irregular. However, that there is a toxæmia in all cases is evident. That the cardiac and cerebral symptoms are caused by a toxin is obvious. Heart

failure from toxæmia is the usual cause of death. Yersin's serum was tried by the Commission on a number of clinically chosen cases (excluding very severe or septicæmic cases) against controls and the result was that serum treatment reduced the mortality by 84 per cent. in sterile cases, but only prolonged life in slight septicæmic cases. The administration of the serum was subcutaneous. It is said that plague marasmus, a profound intoxication of the system, follows serum treatment three times more frequently than in cases treated otherwise. This is said to be due to a sudden abnormal disintegration of the bacilli by the serum. I have failed to discover that this marasmus after serum treatment in plague is more frequent than after any other severe toxic infection. In my experience it is less evident after serum treatment than following any other method of treatment. I claim that adequate treatment with serum will prevent marasmus by neutralizing the toxæmia present.

In 1908 the Advisory Board in London directing the Plague Commission reported "Yersin's serum shows no indication of any advantage, the reduction of mortality in sterile cases is of no definite significance." I wish to challenge this finding at the present day as it is entirely opposed to our clinical findings in Baghdad in 1922 and 1923.

There is an idea that Yersin's serum has very little or no antitoxic power and is bactericidal but I am informed by the Pasteur Institute that the serum is definitely antitoxic and does not possess any well marked bacteriolytic and bactericidal properties. 75 per cent. of my cases were admitted for treatment on the third to eighth day of disease, when the disease had already become septicæmic and the average maximum height of fever recorded in all the 125 was 103.1° F. In only eighteen cases was a temperature of over 100° F. not recorded and these were either admitted as moribund cases or admitted late in the disease. Admitted within the first five days of illness were 53 acute cases with 16 deaths or mortality 30 per cent. as compared with 63.5 per cent. mortality of the serum-treated cases in the 1905-1908 Commission's investigations at Bombay. We are now faced with the question of virulence. Were the Baghdad 1923 cases suffering from as virulent an infection of plague as the Bombay 1905-1908 cases? This question of virulence of various outbreaks undoubtedly arises. In Baghdad the consensus of medical opinion was that the infection in the 1923 outbreak was more severe than in the previous years, greater cerebral disturbance and more pulmonary complications. It is obvious that for true comparison controls in the same epidemic are necessary. From our experience of the serum treatment however I would not be justified in withholding serum from toxic cases under my care.

The method of treatment by serum in my opinion should follow the lines laid down from our experience with diphtheria anti-toxic serum, viz.: Give quickly and in sufficient dosage: in urgent cases by the intravenous route. Repeat it as required by the evidence of the toxæmia and do not be afraid of it. As in diphtheria do not allow the immediate beneficial

effect of the neutralization of the toxins to cause you to overlook or under-rate the serious damage already effected upon internal organs, particularly the heart. Do not allow too hurried convalescence. In my experience the specific antitoxin serum in plague is as necessary a part of the treatment as is diphtheria antitoxin in diphtheria. Right methods of use are required in each to get the best results. A practical point—the desiccated serum (Pasteur) is equally efficacious and keeps indefinitely. No contra-indication nor harmful sequelæ to serum treatment were discovered.

The Pasteur Institute have kindly informed me that in 1909 the technique of the immunization of the horses for serum production was changed from intravenous injections of small quantities of live bacilli to subcutaneous injection of large doses of bacilli killed by application of heat at 60° C. for one hour. This change in technique may have augmented the amount of antibodies in the serum and so account for the better clinical results since 1908.

DEDUCTIONS FROM MY OBSERVATIONS IN THE ABOVE OUTBREAKS.

(1) Bubonic plague is endemic in Baghdad. In the inter-epidemic periods plague infected rats are continuously found though in small numbers.

(2) Climatic conditions determine the onset and cessation of the disease in epidemic form. A mean weekly maximum temperature above 100° F. and a weekly minimum temperature below 40° in Baghdad are inimical to plague.

(3) The protection of the population by anti-plague vaccine is definite and almost complete.

(4) There is evidence that some protection may last longer even than one year.

(5) The best method of treatment is by the anti-plague serum (Pasteur), the results of which completely justify full confidence being placed in it. Large doses by the intravenous route in the toxic cases are required to be given as soon as possible. Doses of less than 40 c.c. are useless. An 100 c.c. dose intravenously is required in very toxic cases. An initial large dose gives better results than a moderate dose repeated. The myocarditis of plague toxæmia is severe and dangerous and must always be considered.

I wish to acknowledge my indebtedness to Dr. Todd, the resident medical officer of the Isolation Hospital, for his careful records of the cases and assistance in collecting the statistics.

Dietetic Treatment in Diabetes Mellitus (W. R. Campbell, *Canadian Medical Association Journal*, vol. xiii, July, 1923).—The author discusses the principles underlying the dietetic treatment of diabetes mellitus; these are applicable in cases treated with insulin as well as other methods, in fact the author lays stress on the fact that insulin is inclined to be harmful if proper attention is not paid to dietetic regimens. A standard diet for diabetes is suggested with instructions as to its application in treatment.

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SOME COMMON WEEDS AND THEIR THERAPEUTIC USES.

THE writer, in a leader on plants and flowers in THE Journal, July 16, 1923, discussed under the title "Aromatic Plants and their Old-time Uses," p. 243. As Roper kindly assisted me by collecting information on the subject which proved of interest to many

medical men. Chambers's Journal of July 16, 1923, the same date as the above article was published, contained an article by Mr. Harwood Brierley entitled, "Good Services of our Commonest Weeds," which bore evidence of considerable study of a much neglected subject. A perusal of Mr. Brierley's writings will repay reading, for it must be remembered that in all countries weeds are a fruitful source of household remedies, and from them many of our Pharmacopœial preparations are derived. From a medical standpoint a few of these weeds will be found of intense interest from their historical bearing, if for nothing else. To begin with, let us mention coltsfoot, the standby as the household remedy for asthma and coughs. It is in some parts of the country termed foalfoot, and yet again cleats. Tussilago is a genus of composite-flowered plants. T. Farfara or coltsfoot is tonic, demulcent and antielectric (curing cough). The words Tussilago Farfara really meant cough-meal; the word Farfara (the Pharpur of the Old Testament) being the name of a tributary of the river Tiber, on whose banks the plant is met with. The word cleat refers to the power of the rootstock in binding earth for roads and canal embankments. Coltsfoot root and the leaf of the plant burnt in a crucible and powdered was rolled in a paper and smoked as cigarettes are to-day; it seems to have been the original tobacco, and inhaled through a straw to allay cough and asthma. It was inhaled pure or stramonium or Lobelia inflata leaves were added to it. Readers will remember their youthful days when the dried tussilago of the fields was used in place of tobacco, and a clay pipe was the means by which the smoke was inhaled. It was an advance on the brown paper which was the boys', and girls', first "tobacco" when jaundice was a frequent sequel of excessive use.

The coltsfoot rock of our school days, the bath pipes exhibited in the sweetie shop windows, lozenges, tablets and a variety of preparations made palatable with sugar, and liquorice, &c., are perhaps forgotten to-day, but in country places they still hold their own.

Horehound, the Marrubium vulgare, a labiate plant, runs coltsfoot closely as demulcent in cough, and has other uses which recommend it to mothers with young children suffering from gastric catarrh, and as a vermifuge. A fluid extract is made from it, given in doses of from one to two drachms (4-8 c.c.). The leaves and tops are officially designated as "Labiata marrubium," and used in the above fashion, and especially as a substitute for coltsfoot.

The dandelion, one of the most plentiful of our weeds, is the source of the taraxacum of our pharmacopœias. Scientifically termed Leontodon taraxacum, this yellow-flowered weed is widespread and prolific to a degree. We find it in our salads. There is no part of it that is not used. Its flower heads, stalks, leaves and roots are used in making "botanical beer," and a high price is paid for the plant.

The weed, plentiful as it is, commands a high price, Mr. Brierley tells us that "after the outbreak of war the price paid for first-class dandelion-roots rose to one hundred and thirty shillings per hundred weight," and states they might be worth £10 per cwt.

The dandelion root should be collected and dried during the winter months, from October to May, and sent to the manufacturing chemist, from which he extracts dandelion or taraxacum, from which are produced the official preparations of the British Pharmacopœia, and the homœopathist stores his empty boxes with the drugs peculiar to his quaint belief. The essence of the root has laxative, hepatic, diuretic, stimulant and tonic properties. The root may be dried and roasted in a moderately hot oven, and the product powdered. As a bird-seed, linnets and goldfinches relish the powder, and it reconciles them to cage life in a wonderfully short time.

As a substitute for coffee dandelion root has been prepared with or without chicory. Many animals eat the leaves and seeds greedily, especially horses, also rabbits (in their hutches); and when roasted and powdered any and every part are consumed.

Burdock, the plant *Arctium Lappa*, frequently added to beer, has aperient, diuretic and diaphoretic properties, and a tinctured fluid extract is used as a medicine.

Docken—the *Rumex crispus*, entitled the "lesser dock"—is, according to herbalists, useful as a "spring clean," whether to the system in general, or as a skin specific in herpes of various sorts (herpes circinatus). As an application for the stings of bees, wasps, or the stinging nettle, the dock leaf wrapped round the finger or laid open on the skin in any part serves to deaden the smarting induced. When the root is snapped across, it changes colour to a sulphur hue and tastes quite bitter; a home-made decoction, often styled a tonic beer, acts as a laxative in moderate doses, but in larger quantities, or more concentrated, it acts as a cathartic, and is useful, when applied externally, as a bath salve or soap. White dock-seed, that is before the seed is over-ripened and turned to a bronze colour, is much favoured by small birds, songsters especially as Mr. Brierley has it, and, he adds, probably all dock seeds which do not drop on the ground and sprout during the autumn are cleared off by small songsters during the winter.

Groundsel is the farmer's pest and the gardener's constant enemy. There are two varieties, the *Senecio vulgaris* and the *S. gracilis* or life-root. The appearance of its grey-bearded seeding plants, which are believed to ensure medicinally healthy old age, is well known. Its action in mild-strength decoctions serves as an alternative and diaphoretic, but in strong doses it may become emetic in action. As a home-made medicine it has been lauded in colic, both intestinal and renal, and in jaundice. In inflammations of the skin, erysipelas, furuncles, pimples, and even freckles, it is valued when administered as a hot fomentation. In conjunctivitis it is or was much used as an eye wash.

The *Urtica dioica* or stinging nettle is still regarded with reverence in the country-side, and young nettles in the spring are forbidden to be disturbed. From time immemorial a halo has protected it and some centuries ago it was listed with grass, grain, hops and honey as a tithe and valued accordingly. Nettle-tops in spring were considered superior to spinach. Nettle beer has been a home-made summer drink; in asthma

nettle broth is still valued, and oatmeal porridge declared to be improved by the addition of nettle-top. In tonsillitis it holds a high place amongst medicines. Its action is believed to be useful in scurvy and to serve as a general tonic.

Stellaria media—chickweed.—The plant known chickweed—"found as soft ever green mats," which according to Mr. Brierley, "defy the allotment holder and the gardener in general"—abominated as a pest has many properties for which it is held in high favour. It is outwardly applied as a poultice to inflamed surfaces and markedly for suppurating breasts, whilst for swellings on face, hands, feet, sores, scabs, itching surfaces, and varicose ulcers the leg it is much sought after in making hot fomentations—even in rheumatic pains, of the lower limbs especially. The demulcent and refrigerant properties it possesses give it succulent properties which allay heat and inflamed surfaces.

Chickweed commands a large sale as a food for birds, and the quantity thus used in our large cities is enormous. Visit the root market in Covent Garden, London, or take note of the hawkers of bird food in Paris: this will convince one of the extent of trade this weed commands.

Charlock shows its pestilent presence in our crops especially, and its prolific yellow flowers give a tinge of colour to the country-side and destruction to the cereal crops it infests. Before it is allowed to seed and whilst yet green, were it cut or pulled and allowed to decompose it would provide valuable fertilizer and manure. It, however, is used when flowered, being a basis of honey for bees. Its pods yield seeds on which pigeons thrive, and several bird-songsters benefit by consuming its tops. We throw away many weeds which are of use to man and birds as a food and have medicinal properties which in the history of mankind have played many useful parts.

To thousands of collectors a livelihood is provided and starving birds are provided with food when richer and more dainty foods are denied them.

J. CANTLIE

Annotations.

Gonorrhœal Keratoderma (A. W. Stillians, Erwin P. Zeisler, *Archives of Dermatology Syphilology*, vol. xiii, No. 3, September, 1923). The authors share the opinion of the French writers Vidal, Jeanselme and Chauffard, that the hyperkeratotic exanthem occurring in the course of severe gonorrhœal arthritis is characteristic, peculiar to gonococcal infection, and is an affection distinct from arthropathic psoriasis.

Pellagra in Ontario (G. H. Stevenson, *Canadian Medical Association Journal*, vol. xiii, July, 1923).—The author describes two cases of pellagra occurring in Canada. The first was ill about 12 months, had always been particular about food

imes refraining from eating for fear of being poisoned. Symptoms were thought to be due to auto-intoxication through being habitually constipated. Diarrhoea and weakness were present, the former continuing intermittently until an acute attack occurred. Pronounced asthenia developed, and the mental state became one of confusion, mild delirium and disorientation. The patient died. In the second case a psychosis developed. There was no known dietetic insufficiency, though the patient had lived in meagre circumstances.

Bacteriologic Findings in a Group of Cases of Pemphigus (F. Eberson, *Archives of Dermatology and Syphilology*, vol. viii, No. 2, August, 1923).—An organism has been isolated from the blood of a series of seven patients, five with undoubted, and two with probable, chronic pemphigus. Four of the cases are undoubtedly of the malignant type. The organism was obtained repeatedly in every case, and was morphologically, culturally and immunologically the same. It is Gram-positive, anaerobic, non-motile, ovoid, or coccoid in form, resembling a streptobacillus in certain respects, is pathogenic for guinea-pigs and rabbits, and possesses definite toxic properties. The bacterium has not been found in normal persons, or in those having certain other skin diseases.

Suggestive lesions have been produced with recently isolated strains of the organism, and a definite clinical picture experimentally demonstrated. It has been re-isolated from the blood of infected animals.

The Use of Bacillus acidophilus Milk in a Tuberculosis Sanatorium (W. H. Morriss, M.D., *Journal of the American Medical Association*, vol. lxxxi, No. 2, July 14, 1923).—The author comes to the following conclusion:—

It is our feeling that whatever improvement has occurred in our small series of patients is due probably to some other factor than the actual transformation of the common intestinal bacteria into the acidophilus type of organism. The psychic element which attaches to any new treatment when given with the suggestion that it is going to bring about marked relief of symptoms doubtless plays a part in our results, but certainly not the predominating rôle. Milk soured by various processes has long enjoyed a useful place in the treatment of gastro-intestinal disorders. Whether the value of acidophilus milk lies in its acidity, the coagulated protein, or in some other chemical property is difficult to answer; but that it is of value to many patients suffering with various gastro-intestinal disorders seems to be shown in our study.

In November, 1921, Cheplin and Wiseman reported favourable therapeutic action by the use of acidophilus milk in a few cases of constipation, and in March, 1922, Rettger and Cheplin published their series of cases of constipation and diarrhoea treated by acidophilus milk with favourable results. Kopeloff and Cheney also reported good results from

the use of acidophilus milk prepared according to Rettger's technique in seven cases of marked constipation occurring in patients with various psychoses, in four normal patients with intermittent diarrhoea. These authors apparently had somewhat the same experience as ours in failing to produce quite the consistent change of flora reported by Rettger.

Bassler and Lutz point out that the so-called substitution of flora is only apparent, as there is no actual decrease in the count of *Bacillus coli* and the anaerobic bacteria in a weighed unit of stool. They attribute whatever benefit may arise from the therapeutic use of acidophilus cultures to their ability to change the reaction of the intestine in the presence of increased putrefaction from an amphoteric or alkaline to an acid reaction. As the usual intestinal flora reappears very promptly after a cessation of feeding of *B. acidophilus*, they feel that "what is accomplished is a camouflage of intestinal toxæmia for the time being."

Gompertz and Vorhaus seem most favourably impressed by their study of a group of 200 patients with chronic constipation and symptoms of auto-intoxication, and 100 patients grouped as having diarrhoea treated by feeding broth cultures of acidophilus bacilli. They attribute their good results to the substitution of the harmless *B. acidophilus* flora for that of *B. coli* type, stating that "the virtue of this remedial agency lies in its ability to inhibit the colon symptoms experienced by their patients before treatment can be clearly laid to some metabolic products elaborated through the influence of *B. coli*. In their series of cases the factor of acid milk feeding can be ruled out, as they employed only small doses of broth culture in treatment. The report of Smith and Kulp, who studied the indican and phenol excretion in the urine of patients on acidophilus milk diet, and found very little if any alteration in the amounts to the Gompertz theory of decreased auto-intoxication.

A more recent communication by Kopeloff reports a very interesting series of experiments conducted in a series of constipation cases in an attempt to show what is the active principle in the relief of constipation by *B. acidophilus* milk feeding. He first fed his series of ten patients on milk sterilized in an autoclave and observed no relief of symptoms. Then they were given a course of *B. acidophilus* milk which had been pasteurized, and to which a lactic acid was added to replace that neutralized with sodium hydroxide as a preliminary to pasteurization. Again there was no noticeable improvement. The patients then were put on rich acidophilus milk reinforced with lactose, and great improvement in the symptoms of constipation were noted. This improvement was found to continue for as long as six months after the ingestion of the milk had been discontinued, and viable organisms were recovered from the stools months after the discontinuance of the milk feedings.

It is evident from Kopeloff's experiments that, at least as regards the relief of constipation, the

viable organisms in the culture seem responsible for the amelioration of symptoms; but just how this action takes place is still a matter for speculation. It seems quite possible that, while constipation is relieved by some bacterial reaction, the diarrhoea and digestive disturbance groups are more benefited by some biochemical reaction not dependent on a transformation of the intestinal flora to an aciduric type, for in our study we have failed to show improvement as dependent on an actual change of flora.

The Precipitin Reaction of Thyroglobulin (Ludvig, M.D., Anton J. Carlson, M.D., and Kamil Schulhoe, M.D. (*Journal of the American Medical Association*, vol. lxxxi, No. 2, July 14, 1923).—The authors came to the following conclusion:—

The early view that thyroid hormone is secreted into the lymphatic system rather than into the blood capillaries was based mainly on inconclusive histologic evidence. In 1910 Carlson and Woelfel applied the existing available tests for thyroid secretion to lymph collected from enlarged thyroids in dogs with uniformly negative results, except some tachycardia and elevation of temperature on intravenous injections of large quantities of the lymph into dogs not under anaesthesia; but these effects were also produced by similar injections of dog blood. The iodine test and the acetone test of Hunt were negative, and intravenous injections of large quantities of thyroid lymph on dogs under ether anaesthesia had no effect on the heart and blood-pressure.

There is ample clinical evidence, and also experimental evidence (Oswald Koch), that the thyroid hormone is identical with or contained in the globulin fraction of the thyroid. The thyroxin of Kendall, an iodized protein radical with a structure nearly identical with tryptophan, retains some or all of the specific physiologic actions of the thyroid hormone, at least in animals in complete absence of the thyroid. The recent work of Hunt shows less activity of the thyroxin than the whole thyroid (the acetone test). It is an open question, therefore, whether thyroxin is the active thyroid secretion. But assuming that thyroxin is the active hormone, there remains the possibility that it leaves the thyroid in more complex form or as thyroglobulin, and that the final splitting takes place in the tissues, where the active work of the hormone is accomplished.

The present tests demonstrate in the thyroid lymph a thyroid product (thyroglobulin), which probably constitutes or contains thyroid hormone. As our observations were made on hyperplastic thyroids, they should be repeated if possible on dogs with normal thyroids. It remains to determine also whether the blood coming from the thyroid gland contains less thyroglobulin than the thyroid lymph. The failure of the test on the blood from the general circulation may be due to the great dilution of the thyroid lymph when mixed with the total blood, or to rapid absorption of the

thyroglobulin by the tissues. Perhaps these points can be settled by experiments.

The precipitin test may furnish a useful index of physiologic and pathologic variations in thyroid activity in animals under experimental conditions as well as in man, especially in cases of ligation of the superior thyroid artery and veins of the superior thyroid poles under local anaesthesia. The main thyroid lymphatics are included in this ligation. If the lymphatics are not torn they fill up quickly, and may be isolated and cannulated in a relatively bloodless field.

Finally, we would point out that other hormone present problems similar to those of the thyroid. There is no proof as yet, for instance, that the internal secretion of the suprarenal medulla is really epinephrin and not some more complex compound.

Abstract.

FEDERATED MALAY STATES.¹

In the absence on long leave of Dr. R. Dowden, Principal Medical Officer, the report on the Medical Department of the Federated Malay States for 1922 is signed by Dr. F. E. Wood. Supplemental reports by Dr. H. P. Hacker, Malaria Research Officer; Dr. A. T. Stanton, Director of Government Laboratories; Dr. A. R. Wellington, Senior Health Officer; and Dr. W. F. Samuels, Medical Superintendent, Central Mental Hospital, Tanjong Rambutan, are attached.

The estimated population of the Federated Malay States for 1922 was 1,360,876, including about 6,000 Europeans. The birth-rate for the year was 25.65, and the death-rate 25.74 per thousand. The death-rate was the lowest recorded for twelve years. Infantile mortality rate was 170.83, compared with 183 per thousand in 1921.

The principal diseases from which death resulted were malaria (11.44 per cent. post-mortem), dysentery and diarrhoea (1.78 per cent. post-mortem), pulmonary tuberculosis (1.76 per cent. post-mortem), and beriberi (0.33 per cent. post-mortem). The total number of in-patients treated in all hospitals and institutions throughout the Federated Malay States during the year was 92,690, with 7,334 deaths and a death-rate of 7.91 per cent., compared with 116,785 cases, with 8,294 deaths and a death-rate of 7.10 per cent. in 1921. The number of out-patients treated by all hospitals and dispensaries for 1922 was 433,111, as compared with 329,310 for 1921.

MALARIA.

Malaria was, as always, the most prevalent disease. There were 26,072 cases treated in hospitals, with 1,403 deaths and a death-rate of 5.38 per cent., against 37,049 cases with 1,944

¹ Medical Report for the year 1922.

deaths and a death-rate of 5.24 in 1921. These figures show a satisfactory decrease, although the death-rate is a little higher than in 1921. Free quinine is always available, and is distributed throughout the country through the medium of subordinate native officials, police stations and schools. On the advice of the Malaria Advisory Board, each patient who has suffered from malaria in a hospital is given a certain number of tablets of quinine to take away on discharge. Cinchona extract is being used in some hospitals and shows good results—in some cases better results than quinine. Meetings of the Malaria Advisory Board were held monthly during the year. Propaganda articles and notices issued by the Board were published frequently in the local newspapers.

The following figures relate to field and laboratory work in connection with anopheline mosquitoes carried out by the Malaria Bureau during the year:—

Breeding places described	...	...	941
Larvæ identified microscopically	...	71,421	
Adults bred out and identified	...	23,621	
Adults caught in houses	...	10,327	
Adults tested for egg-laying capacity	...	1,257	

Observations were continued throughout the year to determine whether the various species of anopheline mosquito have a definite breeding season, or whether they are capable of breeding all the year round. In connection with these observations the Malaria Research Officer draws the following conclusions:—

At the present stage it is impossible to base definite conclusions on the work in hand, but certain temporary deductions can be made. In last year's report it was stated that "no definite correlation between species and the rainfall could be established," and the main reason for this statement was that there were two increases in small pool breeders, one of which occurred in the wet and the other in the dry period of the year. But when the results of this year are added to those of last year, it is seen that these increases in small pool breeders occur in a regular manner, and reasons for them occurring in the way they do have been suggested above. These reasons will form the hypothesis to be tested by the results to be obtained during 1923, and they will be confirmed if the results are similar to those obtained during the two previous years, which are the first two years of the present research.

VENEREAL DISEASES.

The total number of cases treated was 5,312 with eighty-four deaths, as compared with 6,222 with twenty-two deaths in 1921.

The public are slow to take advantage of hospital treatment for venereal diseases. The Venereal Diseases Advisory Board has freely distributed pamphlets and posters urging people to come to hospitals and dispensaries for early treatment.

Injectations of novarseno-benzol compounds and mercury for cases of syphilis are given at all government hospitals. A considerable increase of

patients attending for these injections was noticed, when it was decided to adopt the method used in the Dutch Indies of charging for each injection to those who could afford to pay. Free treatment for poor people is still given. The chief difficulty is to persuade patients that one or two injections will not cure. After a few injections, when the outward and visible signs have disappeared, they imagine they are cured and will not trouble to come for more. The number of injections of novarseno-benzol compounds given for syphilis was 19,690.

ANKYLOSTOMIASIS.

The total number of cases treated in hospitals during the year was 4,223 with 347 deaths and a death-rate of 8.22, as compared with 5,157 cases and 446 deaths and a death-rate of 8.65 for 1921. Routine examination still shows that ankylostome ova are very common amongst hospital patients.

DYSENTERY AND DIARRHŒA.

The total number of cases treated in hospitals was 4,847 with 934 deaths as against 5,908 cases with 1,139 deaths in 1921, a considerable reduction. Although dysentery and diarrhœa rank next to malaria as a cause of death, the death-rate for the country in 1922 was 1.78 per thousand, the lowest recorded for the last ten years.

BERI-BERI.

As was anticipated, the number of cases of this disease treated in hospitals shows an increase over the number for the two previous years. The death-rate was, however, lower than any year since 1914. The figures for the year were 1,122 cases treated with 140 deaths, a death-rate of 12.48 per cent. Dr. Wood makes the following remarks on the subject of beriberi:—

"The Chinese are reverting to the consumption of polished rice now that it is more easily obtainable. The Senior Medical Officer, Perak, reports that Malays are acquiring a taste for this form of rice in preference to their own much more wholesome rice.

"There is little doubt but that the shortage and the control of rice during the war had a great effect on the incidence of this disease. Polished rice being not so easy to obtain drove the Chinese to other food-stuffs, with the result that beriberi decreased.

"Polished rice is now plentiful, and unfortunately it is cheaper than undermilled or parboiled rice, so it is more commonly used. Polished rice has also more attractive appearance than undermilled or parboiled.

"By propaganda it is hoped to warn the people of the danger of polished rice as compared with undermilled, but undermilled rice should be freely obtainable, and an effort should be made to put it on the market at as cheap or cheaper rate than polished.

"Extract of rice polishings made by the Institute for Medical Research is now freely used in the treatment of beriberi cases. It is especially useful

in acute cases, and undoubtedly tends to shorten the course of the disease."

PULMONARY TUBERCULOSIS.

The total number of cases of this disease treated in hospitals during the year was 2,214 with 1,062 deaths and a death-rate of 48.05, as compared with 2,152 with 993 deaths and a death-rate of 46.14 for the year 1921. The mortality rate is high, as those suffering from this disease always seek admission only when they are in an advanced stage.

YAWS.

During the year the treatment of cases of yaws by means of injections of novarseno-benzol compounds was continued. The total number of injections given was 30,492, as compared with 22,972 in 1921. Malays who are the chief sufferers from this disease are learning to appreciate the value of the treatment. The main difficulty to be contended with is to persuade patients to come for a second or third injection, owing to the fact that results from a single injection are usually so striking that they imagine themselves to be cured. Nevertheless, the campaign against this disease during the past two years has fully justified itself, and in certain districts practically no cases are now to be found.

MENTAL CASES.

There were at the close of the year 1,050 inmates of the Central Mental Hospital, Tanjong Rambutan. The same causes operated to keep the admission rates high as in 1921. The chief forms of disease accounting for admission were recent mania (112), recent melancholia (102), confusional insanity (73), primary dementia (52), and general paralysis of the insane (27). Discharges amounted to 241 against 194, and recoveries to 207 against 177 in the previous year.

LEPROSY.

Under the heading "Treatment of Leprosy," Dr. Wood makes the following remarks:—

"The E.C.C.C., or the ethyl esters of chaulmoogra, camphor and cresote treatment, has been carried out with good results. The E.C.C.C. intravenous or intramuscular injection is the chief treatment adopted. This treatment gives very encouraging results, though it is difficult to state definitely that the disease can be cured by this means. Some reaction is shown after the injection, which at first discourages the patient from persevering in the treatment, but many of the patients now realize that they improve under treatment, and it is becoming more popular. Two cases at Pulau Pangkor Laut have shown such improvement that it is hoped that it will soon be possible to discharge them from the asylum. The progress of the disease has been arrested and they are no longer in an infective condition. It will be necessary, however, to keep them under observation for some time to come.

"Cases with bad ulceration have been treated

with tartar emetic. One grain in 10 c.c. of the distilled water has been injected twice weekly. The results have been most encouraging."

GENERAL.

The number of operations undertaken during the year was 781 major and 4,428 minor operations. The total number of vaccinations performed was 65,201. The number of cases vaccinated compares favourably with the number of births during the year.

Infant welfare centres have been established at Taiping, Ipoh and Kuala Lumpur in connection with the town dispensaries. That in Kuala Lumpur was opened in April under the charge of a local medical officer, assisted by a European nursing sister who had previous experience in infant welfare and has proved very successful, the number of attendances of women and children during the year amounting to 4,076.

Malay midwives are beginning to show a keen interest in the work done at the Women's Hospital, Kuala Pilak, which is under the charge of a local medical officer. They are allowed to see the routine work of the hospital, including the nursing of the patients and the treatment of infants. A week's course of instruction is open to them, and these lectures have done much towards removing the prejudice in the native mind against European midwifery. The observance of those Malay customs which are not detrimental to the patients is allowed, while the reasons for not allowing others are carefully explained. The marked decrease in the rate of infantile mortality bears witness to the value of this work.

Five Ford ambulances were used during the year for travelling dispensary work, and provide a very satisfactory means of getting into touch with the sick in outlying villages.

Five Sunbeam ambulances are also attached to the hospitals.

The total expenditure of the department during the year amounted to £300,021.

Current Literature.

BULETIN DE LA SOCIETE DE PATHOLOGIE EXOTIQUE July 11, 1923.

Plague Epidemics in Russia (D. Zabolotny).—During the years 1914-1922 Russia has suffered considerably from plague epidemics. Most cases have been observed in Manchuria and Transbaikalia, and about 2,000 cases were fatal. The epidemics coincide with the epizootics among savage rodents, and there is reason to believe the cause of plague epidemics is now definitely established.

Anti-plague Vaccine administered per Os (Leger and M. Baur).—Investigations have been made by the authors on laboratory animals with a view to immunizing man from plague by vaccine

tion per os. This method of treatment is more readily accepted, especially by blacks, than inoculation, and it is believed, will be just as efficacious for man as it has proved for animals. Further investigations will determine the quantity of vaccine to be administered, also the quantity of oxalide to be taken previous to the ingestion of the vaccine.

Tabes in the Natives of French Colonies (A. Thiroux).—Till recently it was believed that the French Colonies were exempt from tabes. Fontoyent has only observed one case, and Le Dentu states he has never seen this disease in natives.

According to reports of Allain and Augagneur on the Anti-venereal Service in Madagascar in 1921, three cases of tabes were observed, and another three cases in 1922.

Broncho-spirochaetosis in French Guiana (V. Labernadie and E. Peyre).—The authors describe the first case of this type observed in Guiana. The patient, an Annamite, entered hospital complaining of a dry, painful cough and retro-sternal pains and fever. Laboratory examinations showed *Plasmodium vivax* in the blood; trichocephalus eggs in the stools, and numerous blood cells in the sputum. In the fibrinous parts of the sputum spirochaetes of Castellani abounded, 6 to 10 microns long, 0.4 micron wide, and there were a few 14 to 17 microns long and 0.3 wide.

The fever gradually diminished, and one month after entry to hospital the patient was afebrile. This disease is easily confounded with pulmonary tuberculosis.

Blastomycosis of the Lachrymal Duct (M. Dekester and G. Jeune).—The agent of this disease is an undefined saccharomycete. It is common among asses of the Fez Region, Morocco. The first case was observed two years ago. The affection breaks out at the beginning of the warm season, and the animals affected are generally from 1 to 4 years old. Besides tumours in the eye, the parotid ganglia swell. The animals themselves remain in good general condition. The affection has never been observed in any other animals.

Apropos the Anti-malarial Struggle at Beyrouth (J. Emily).—The author alludes to the article of Legendre and J. Louis (*Bull. No. 2, 1923*) on "Anophelisme et Paludisme à Beyrouth," wherein they state it is useless to continue the prophylactic measures in force for the past three years. The reason for this statement was the rarity of cases observed in 1922, but J. Emily points out that the rarity is due to the prophylaxis and anti-larval works of the previous years. Cases of malaria are still observed in Beyrouth, and it is necessary to take very precaution against disease.

Bilharziosis in Portugal and in Morocco (H. Harrier).—Tarvira, in the province of Algarva, is site of bilharziosis in Portugal, where *Planorbis fowarii* are found in abundance in a small pond used for washing. The first case was observed by Morges in July, 1921, and the patient had never

left Portugal. It has been thought the disease was imported from Tangiers, but the author thinks this improbable. Although *Ballinus contortus* and *P. dufourii* are found in the region of Tangiers, bilharziosis does not exist there.

Elephantiasis in the Fez Region (M. Dekester and L. M. Martin).—Five cases of this disease have been observed among natives during the past three years, four men and one woman. None of them had ever left Morocco. No cases of filariasis have been seen.

Narrative of a Voyage from Dabola to Kankan-Kissidougou Shores of the Milo and the Niger and Region of Dalaba (F. Sorel).—The object of this journey was to determine (a) malarial infestation in native children; (b) the proportions of stillbirths and infantile mortality. 5,976 children were examined in various villages, and of these 2,858 were infected. Examination was made by palpation of the spleen. Infestation on the banks of the Milo and Niger is greatly increasing, especially among fisherfolk, but the disease is rare in the Dalaba region. Stillbirths are also numerous, and many infants die of malaria before the age of 4 or 5 years.

Clinical and Experimental Study of Infectious Anæmia in Equidae of Morocco (Balozet).—In a previous number of this *Bulletin* (April 13, 1923) a note appeared on a non-classified affection of the horse in Morocco. Further investigations (1921-1922) have since been carried out. The disease is inoculable in the ass by means of blood of the horse; it is also inoculable by filtered serum. Conservation of the virus was not obtained by passage in the pig, and injections of strong doses of serum (Basset's method) could not reproduce fever attacks. The malady involves leukopenia, but not very marked. Sometimes auto-agglutination of the corpuscles is observed.

Veneral Diseases in the Garrison of Antananarivo (L. Collin).—The number of Europeans and natives affected is deplorable, and little has been done for prevention of diseases. As a means of prophylaxis the author suggests the distribution of preventive ointments, &c., instructive and moral causerie at meetings, and early treatment. The pomade prescribed is: Cyanide of mercury, 0.10; thymol, 1.75; calomel, 25.00; lanoline, 50.00; vaseline, 100.00.

Apropos Cases cured by Vaccinotherapy (G. L. Huchard).—Four cases are described of furunculosis of the back and face; amygdalitis; confluent acne of the face; furunculosis of the genito-crural region, completely and rapidly cured by auto-vaccine. All the cases were of long standing and had been refractory to many other treatments.

Endemic Index of Malaria in the Haute-Volta (M. Leger and E. Bedier).—At Ouagadougou the blood of forty-six children, 5 to 10 years old, was examined; all harboured parasites. At Dedougou twenty-five of forty-one examined were affected. The percentage affected at Bobo-Dioulasso was 75.

same as that of Onagadougou. During the month of May *Plasmodium praecox* is the commonest parasite.

Treatment of Guinea-worm by Intravenous Injections of Emetin (R. Le Dentu).—Very good results have been obtained with this treatment, and although the worms were not eliminated in every case, it caused rapid disappearance of inflammatory phenomena and of lymphangitic oedema. The treatment is well supported by patients, and cases of nausea and vomiting are rare.

On the Subject of Quinine Tablets (R. Le Dentu).—A patient, female, aged 32, who had always taken preventive quinine, emitted seventeen tablets in two stools in forty-eight hours; they had accumulated in the intestine owing to constipation. She was suffering from appendicitis, and had been fasting thirty-six hours. On examination the tablets were found to be of sulphate of quinine and not of bichlorhydrate.

The author confirms the statement of other authorities (1) that quinine tablets should only be given to people who are not dyspeptic; (2) that the tablet should be taken with food; (3) they should never be given to patients on a hydric diet.

Measures directed to the Extinction of Malaria in Corsica (S. and C. Abbatucci).—In view of the fact that measures for the complete extirpation of anophiles and their larvæ in the island would have to be on a very large scale, it is suggested that the human reservoirs of infection should be dealt with systematically by quinine to prevent any recurrence, that mosquito nets should be generally employed, and that the insects and larvæ should be dealt with, as far as possible, by winter campaigns.

The possibility of using toxic gas, such as chloropirrin, for the extermination of insect life over large areas is referred to.

Treatment of Acute Amœbic Dysentery by Stovarsol (Nogue and Leger).—Of three natives treated with stovarsol alone two were cured. Tablets 0.25 grm. were used. The drug can be used when emetin is contra-indicated.

Preliminary Note on Renal Insufficiency in Cases of Bilharziosis. Treatment by Emetin (Nogue and Boulay).—Ambard's constant in twenty-four cases examined of bilharziosis was over 0.90 in fifteen cases, and was higher than 0.115 in most of the cases; in nine cases the constant was below 0.90.

On treatment with tartar emetic those with a high constant did not show intolerance, and only the cases of tuberculosis showed unfavourable reactions, such that the treatment had to be discontinued. Two patients showing clinical symptoms of nephritis and bilharziosis were cured by intravenous injections of emetic over a long period. In one, the constant became normal and the oedema disappeared.

Schistosomum hematobium at Libreville (Gabon). Autochthonous Bilharziosis, Imported Bilharziosis

(P. Chapier).—Four cases of bilharziosis examined lead to the conclusions: (1) That there is possibility of infection with bilharziosis due to *Schistosomum hematobium* of local origin in the district of Libreville, and (2) that infection in two of the cases was imported.

Treatment with emetin, when borne, is more rapid than with tartar emetic.

Juxta-articular Nodosity and Treponema (P. Chapier).—A native, aged about 27, who had suffered from pain when 3 years old, was treated for nodosities near the crest of the right tibia of three to four years' standing.

Numerous treponema were present, and *Treponema pertenue castellani* is considered to be the cause. Cure was effected with novarsenobenzol.

Identification of Plague by Liver Puncture. Prophylactic Importance (G. Bouffard and Gerard).

—The authors have found that the germs can be easily detected in large numbers by simple puncture of the liver of the cadaver and withdrawal of fluid by means of a hypodermic syringe. It has been found that many cases of death reported as due to malaria have been due to the septicæmic form of plague, which is very difficult to identify by other methods. A syringe to contain 2 c.c. may be used, and the puncture made in the fifth intercostal interspace.

The technique is described in detail. Some abnormal forms have been found. The method is considered to give 85 to 90 per cent. positive results in all cases of death from plague, and to be practically certain in cases where there has been rapid septicæmic or positive pulmonary plague.

Application of the method to the living is not of great value, because the bacilli are generally not plentiful in the liver until near fatal termination of the disease.

Cutaneous Venoms of Bombinator pachypus Fitzinger and Blasius (M. Phisalix).—The venom excreted by the mucous glands on slight excitation is highly poisonous to the frog and the white mouse; common toad is more resistant. The poison paralyses, and is mydriatic and diastolic. Its power is attenuated by heating, and it can then be used as a vaccine to increase resistance.

The granular venom has similar effects to the dorsal venoms of other batrachians; it is primarily convulsant, myotic and cardiotoxic. It is not much affected by prolonged heat—sufficient to destroy the mucous venom.

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Original Communication.

INVESTIGATIONS ON JAUNDICE OF BACTERIAL ORIGIN.

By LUDWIK ANIGSTEIN, M.D., Ph.D.(Heidelberg),

AND

ZOFJA MILINSKA.

From the State Institute of Hygiene, Warsaw (Director, Dr. L. Rajchman).

DURING the Great War an increasing number of epidemic or sporadic cases of diseases with icteric symptoms was observed by different authors.

Statistics of disease of the liver collected by T. Müller (1922) during 1914-1922 indicate that in 1920 the number of jaundice cases was twice as great as before. It reached its maximum in 1921. The largest epidemic of jaundice was observed by Garraillhé and Clunet (1916) in the Dardanelles. This illness was spread among the Allied Armies, and was characterized chiefly by intestinal troubles, a rise of temperature to 38-40° C.—an enlargement of the spleen in the majority of cases. A similar disease was observed by Brugsch and Schürer (1919) and Cantacuzène (1918) in Roumania. Both epidemics were observed in the late summer and autumn; the number of jaundice cases in Roumania reached several thousands. This disease started in the majority of cases with a rise of temperature accompanied by intestinal trouble, nausea and sometimes vomiting. The liver and spleen were enlarged; jaundice appeared on the third or fourth day. The authors consider this disease as mild, but it was fatal, especially in the case of pregnant women.

In the autumn of 1921 we observed in Polish Wollhynia an epidemic of jaundice the epidemiology and clinical symptoms of which correspond to the above-mentioned epidemics. This disease was spread chiefly in the town of Równe (Wollhynia), where about 250 cases of jaundice were observed within three months. The clinical course of the disease was uniform. In the majority of cases a rise of temperature to 38-40° C and intestinal disturbance could be noted. All patients complained of nausea and pains in the epigastrium. A general jaundice appeared in a few days after the first symptoms, and persisted for a period of three to four weeks. The liver and the spleen were mostly enlarged and painful. The enlargement of the liver could be observed in some patients even for several weeks, when all symptoms of the disease had disappeared. This fact indicates that the enlargement of the liver is due not to a simple stoppage of the bile, but that very important changes in the tissue of this organ had occurred requiring a longer time for the regeneration.

Examination of the blood showed on an average 4 or 5 millions of red corpuscles; in some cases slight leucopenia of 4,500 white corpuscles per cubic millimetre was observed, but cases with 2,000 to 14,000 white cells per cubic millimetre were also observed.

The blood picture was characterized by a relative lymphocytosis of 50 to 75 per cent. of large and small lymphocytes, and by a relative increase of eosinophiles up to 15 per cent. Brugsch and Schürer consider that these features are very characteristic for this form of jaundice of the so-called "icterus catarrhalis."

Besides the epidemic jaundice in Wollhynia we also examined forty sporadic cases of this disease in different hospitals in Warsaw and environs, altogether ninety-three cases. Among this number sixty-seven cases could be clinically identified with the "catarrhal jaundice." The clinical course of the disease was similar in sporadic as well as in epidemic cases and generally mild, but we noted also five very severe cases of jaundice ending fatally.

The epidemic spread of the jaundice among the population of Wollhynia, in addition to its clinical course, especially in the severe cases, indicated an infectious origin. Our investigations on the aetiology of this disease were performed at first in Wollhynia in the direction of Weil's disease, but the results were negative; guinea-pigs injected with fresh urine of severe cases in the second week of the illness were without effect. Weil's disease being thus excluded, we examined systematically the serum of each jaundice patient for agglutinins against the bacilli of the typhoid, paratyphoid group. On the other hand, blood was cultivated in broth and ox-bile, the faeces as well as the urine being examined by plating.

For the agglutination test we used typhoid, paratyphoid A, paratyphoid B, *Bacillus enteritidis* Gaertner, also the paratyphoid strains belonging to the group of *B. aertrycke*. Agglutination tests were also carried out with strains of paratyphoid C (Hirschfeld). In all jaundice serum was tested for agglutinins with the following seventeen strains:—

Typhoid, paratyphoid A, paratyphoid B, paratyphoid C (three strains from Macedonia and Poland), *B. enteritidis* Gaertner, *B. aertrycke* Gaertner (London, 1917), Reading (1916); hog-cholera (England), East Africa; mutton (Newcastle, 1911); Witts urine, Witts blood (Andrews), Stanley (Hutchens, 1917); Newport (1915), Binns (France, 1917).

All these strains, supplied us by Dr. Schütze (Lister Institute, London) were cultivated during the Great War from patients in which the disease corresponded clinically to paratyphoid fever. As a result of investigations of Hirschfeld and Seydel (1921), Schütze (1920), and Tenbroeck (1918, 1920), the orientation in this wide and mutable group of micro-organisms is now much cleared up and facilitated.

Tenbroeck proved that the hog-cholera is closely related to the paratyphoid C (Hirschfeld). Schütze included in the same group different strains isolated during the war in Mesopotamia by English authors as well as the strain Witts (Andrews and Neave). Investigations performed by Hirschfeld and Seydel showed that paratyphoid bacilli cultivated in Wollhynia and Alabama by Weil and Saxl (1917)

and in Macedonia by Neukirch (1915), and identified by these authors as a type of *B. suispestifer*, belong really to the type of paratyphoid C (Hirschfeld). The group of *B. aertrycke* is, as Schütze has shown, not uniform, and consists of strains which are not agglutinated by the immune serum anti-paratyphoid B, and on the other hand of strains which are agglutinated by immune serum anti-C.

We obtained positive results of agglutination in the following percentage of examined cases:—

		Per cent.	
With typhoid	...	23	
" para A	...	17	Dilution of sera in average 1:100
" para B	...	23	
" para C	...	20	Dilution of sera in average 1:200

These quantitative results, with the exception of paratyphoid C, are approximated to agglutinative properties of normal human sera, as was shown by Rosher and Fielden (1919). The authors obtained only in 8 per cent. of cases a positive agglutination with paratyphoid C and in lower dilutions of the sera.

From this rich collection of used strains only one of them showed an exceptional agglutination with the sera of patients, the clinical diagnosis of which has been "icterus catarrhalis." Among this group, consisting of sixty-seven cases, fifty-six sera (80 per cent.) agglutinated *B. aertrycke* Stanley in a very high degree even in a dilution of 1:6,400. Control tests made with twenty-six cases in which jaundice was due to different causes (cholelithiasis, hæmolytic jaundice, cirrhosis, hepatitis, lues) were negative. Normal sera taken from eighty-five individuals agglutinated Stanley bacilli only in three cases (dilution 1:400). The results of agglutination tests with other strains of the *B. aertrycke* group has been in the majority of cases negative. The Newport strain was agglutinated in 15 per cent. of all jaundice cases in serum dilution 1:50-1:100. With the Mutton strain nearly all tests were negative. Witts was agglutinated with those of the sera which agglutinated at the same time the paratyphoid C, while Binus in 11 per cent. of cases.

Comparatively often the paratyphoid B bacilli were agglutinated—namely, in 23 per cent. of cases. The high percentage of the positive agglutination tests with the Stanley strain we may take as indication that the bacilli belonging to a wide and mutable paratyphoid group approaching to the *B. aertrycke* Stanley plays a great part in the aetiology of the so-called "icterus catarrhalis."

We could not expect that the blood cultures would give us a great number of positive results because the temperature of the majority of patients was nearly normal when examined. We succeeded in cultivating bacilli only from the blood of three severe cases of jaundice.

The first strain (No. 11, Rowne) was cultivated on the third day of disease from a girl returned from Russia. The disease started with diarrhoea, nausea and vomiting, also a rise of temperature to 38.5° C. A general intensive jaundice appeared on the third

day, with a marked enlargement of the liver (2 in below the subcostal margin in the axillary line). The spleen painful and enlarged. On the fourth day a marked excitation of the patient with cerebral symptoms (convulsions) could be noted. From the blood and the urine of this patient we cultivated motile, Gram-negative bacilli which possessed biochemical properties of paratyphoid B, but were agglutinated by the immune sera of paratyphoid C (Hirschfeld) and anti-Witts serum. By Castellani's absorption test we may identify the strain No. 13 with Witts (Andrewes).

The next strain, No. 88, was isolated from a male refugee from Russia, in which the clinical course of the disease with a very marked general jaundice closely resembled the above-described case. These motile, Gram-negative bacilli possess also all biochemical properties of paratyphoid B. They are agglutinated with the immune sera of the paratyphoid C group (paratyphoid C, No. 14, Witts) in a dilution 1:800 to 1:6,400. The serological properties of the strain No. 88 can be determined by the absorption test, in so far that it possesses common receptors with No. 14 and Witts (Andrewes), as well as with the pure paratyphoid C (Hirschfeld).

The strain No. 465 has been cultivated from the blood of a fatal case of jaundice observed in September, 1922, in a family where seven persons fell ill with symptoms of an acute infectious disease similar to enteric fever. The girl from which the strain 465 was isolated showed a very intensive jaundice. From the blood taken on the eighth day of the illness we obtained a pure culture of Gram-negative bacilli, the biochemical properties of which correspond to those of *B. typhosus*. These bacilli are agglutinated not only with the immune serum for typhoid, but also at the same degree (1:3,200) with the immune serum for Stanley. The absorption test has proved this serological relation of the strain 465 to *B. aertrycke* Stanley as well as to *B. typhosus*.

Besides the strains cultivated from the blood of jaundice patients, we succeeded in isolating from the urine of mild cases of the so-called "icterus catarrhalis" four strains of bacilli Nos. 20, 21, 23, 24 which form a separate group. They produce all acid and gas in levulose, acid in litmus milk, which will be alkalized by two of them after forty-eight hours, acid in galactose, A.G. in raffinose, and produce reduction in Rothberg medium. They neither produce indol nor curdle milk. Gelatine is not liquefied.

Strain No.	Motility	Gelatin	Litmus milk	Lactose	Sucrose	Dulcitol	Mannite	Maltose	Glucose	Raffinose	Arabinose	Galactose	Levulose	Indol
20	+	O	A	O	O	O	A	O	O	O	O	A	AG	O
21	+	O	A	O	O	O	A	O	O	AG	O	A	AG	O
23	+	O	Alk	O	O	O	A	O	O	O	O	A	AG	O
24	+	O	Alk	O	O	O	A	O	O	O	O	A	AG	O

The serological properties of these strains cannot be properly determined because they agglutinate very easy even with normal sera in a very high degree.

The identification of these strains with the known organisms is on account of their biochemical proper-

ties not possible. The classification of Castellani and Chalmers ("Manual of Tropical Medicine," 3rd edition, p. 932), which gives in detail the biochemical properties of not less than ninety-eight different species of aerobic asporogenous intestinal bacilli do not include this type. Our attention was especially

Strains	Agglutinating sera.								
	Ty	A	B	C	14	88	Witts	Stanley	465
Ty	12.800	800	200	—	800	1600	1600	1600	1600
Para A	200	6400	1600	—	—	—	—	1600	200
Para B	200	1600	51.200	400	200	—	200	1600	—
Para C	—	200	—	6400	800	800	800	—	—
14	—	—	—	1600	6.400	800	1600	—	—
88	—	—	—	800	800	6.400	800	—	—
Witts	—	100	—	1600	800	800	6.400	—	—
Stanley	1600	400	1600	—	—	400	50	12.800	3200
465	3200	200	—	—	400	800	800	3200	3200

REPORT I.—Containing the results of agglutination tests of typhoid and paratyphoid strains with the immune sera.

Agglutinat. Sera.	Absorbed by strains	Agglutination of strains						
		465	Stan.	Witts	C	14	88	
Kowal 88	88	800	1600	1600	1600	1600	100	
"	C	1600	1600	800	400	1600	800	
"	Rowne 14	800	1600	100	800	100	800	
"	Stanley	100	—	1600	400	1600	1600	
"	Witts	1600	1600	100	1600	200	400	
"	—	1600	3200	3200	3200	3200	6.100	
Rowne 14	14	—	—	—	200	—	—	
"	465	—	50	400	1600	800	800	
"	C	200	—	—	—	200	—	
"	88	—	—	—	200	200	—	
"	Witts	—	—	—	200	—	—	
"	Stanley	100	—	1600	1600	1600	800	
"	—	400	200	1600	1600	3200	800	
C ₁₁₅	88	X						
"	14							
"	C ₁₁₅							
"	465							
"	Witts							
"	—							
"	—							

REPORT II.—Showing the influence of the absorption of immune sera (Para C group) by paratyphoid strains on the agglutination.

Agglutinat. Sera.	Absorbed by strains.	Agglutination of strains.				
		465	Ty	Stanley	Para A B	
Mszczonow	Mszczon	100	—	—	X	
465	465	—	—	—		
"	Ty	100	—	100		
"	Stanley	100	200	—		
"	—	3200	1600	3200	X	
Ty	465	—	—	—		
"	Ty	100	100	100		
"	Stanley	400	800	—		
"	—	3200	12.800	1600	X	
Stanley	465	—	—	800		
"	Ty	100	100	800		
"	Stanley	—	—	—		
"	A	800	—	3200	—	200
"	B	1600	1600	3.200	—	—
"	—	3.200	1600	12.800	400	1600

REPORT III.—Showing the influence of the absorption of immune sera (Ty—Stanley) by the strains Ty—Stanley on the agglutination.

drawn to the fact that none of the four strains will ferment glucose. In the scheme of Castellani and Chalmers we found only one species excepting *B. fecalis alcaligenes* which do not ferment glucose—namely, *B. metadifluens*, but it is in other respects quite different from the biochemical properties of our strains.

The strains Nos. 14 and 88 are pathogenic for animals. The bacilli injected into the abdominal cavity of a rabbit and into the ear vein of another one killed both animals on the third day, producing a general septicæmia. The autopsy of the animals showed an enlargement and hyperæmia of the liver and spleen. The protoplasm of the liver parenchyma cells was vacuolized and shows degenerative metamorphoses. In many places of the liver tissue necrotic foci are disseminated. The interlobular spaces are distorted and partially filled with blood. Infiltrations with cells of lymphoid type are disseminated in the liver parenchyma. Around the biliary capillaries a growth of connective tissue with infiltration of small cells takes place (pericholangitis). In the examined liver of a fatal jaundice case we observed very similar destructive changes with cholangitis and pericholangitis.

We suppose that the destruction of liver cells is due in our cases to a direct action of bacteria circulating in the blood-stream.

CONCLUSIONS.

(1) The spread of jaundice cases observed by us in different areas of Poland gives evidence of its infectious origin.

(2) The clinical picture of the disease is identical with the sporadic cases of "catarrhal jaundice."

(3) The blood picture shows a relative lymphocytosis and eosinophilia.

(4) Among the total number of ninety-three jaundice cases a group of sixty-seven clinically diagnosed as "catarrhal jaundice" could be separated. They consist of epidemic as well as sporadic cases. From sixty-seven sera of this group we obtained fifty-six times (80 per cent.) a positive agglutination with the strain *B. aertrycke* Stanley.

(5) From the blood (or urine) of severe jaundice patients we cultivated two strains of bacilli (Nos. 14 and 88) with biochemical properties corresponding to paratyphoid B and one strain (No. 465), which is biochemically typhoid. Serologically the strain No. 14 is identical with Witts (Andrews); the strain No. 88 is closely related to paratyphoid C (Hirschfeld) and to Witts, while No. 465 is very similar to *B. aertrycke* Stanley and typhoid.

(6) Paratyphoid bacilli belonging to different serological types (autogenic mosaic) play a part in the ætiology of the majority of the examined "catarrhal jaundice."

(7) It is advisable to use for the agglutination tests, besides the common laboratory strains, also the group of *B. aertrycke*.

We are very indebted to Dr. H. Schütze (Lister

Institute, London), who kindly supplied us with a series of paratyphoid strains.

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The Value of Carbon Bisulphide in combating Tent Caterpillars and Mosquitoes (A. K. Fisher, *Journal of Economics and Entomology*, October, 1922).—A few drops of carbon bisulphide was poured into a 10-gallon tub, the water of which was found to be swarming with the larvæ of mosquitoes. The carbon bisulphide sank to the bottom of the receptacle, and took the form of pearl-like bodies. There was great agitation among the insects within a few minutes, and at the end of half an hour all were dead and floating on the surface of the water. The water itself had not been affected, either in taste or smell. Gasoline, in the control of mosquitoes, is objectionable, as it makes the water unfit for many purposes.

Mosquito Control in St. Thomas (E. Peterson and F. Walker, *United States Naval Medical Bulletin*, March, 1923).—The Danish authorities were the first to cope with malaria in the colony of St. Thomas by surface draining. *Anopheles albimanus* is the carrier of the disease. In rural areas fish are the means of keeping the anopheles larvæ in check. *Lebistes reticulatus* (guppy), an indigenous species, is a very voracious feeder.

Two other species of mosquitoes found here are *Aedes calopus* and *Culex quinquefasciatus*. These are effectively dealt with by covering the tubs in which they breed with fine mesh gauze or stocking them with fish; the latter method is the most satisfactory and the least expensive.

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"GREEN'S PATHOLOGY."

THE death of Dr. Thomas Henry Green removes from amongst us the author of "Green's Pathology." The appearance of the volume in the early seventies of the last century marked the birth of the medical schools of this country and the birth of scientific pathology and the foundation of modern medicine. Up to then the chaos of

"humoral pathology" prevailed and gave us a false doctrine to work upon, leading us astray along paths which taught us shibboleths of unsound doctrine. The dictionary tells us that "humor" means the moisture or fluids of animal bodies; some being "good" and some "ill" humors. The sixties of last century saw the end of this pathological nonsense and the birth of the cellular pathology of Virchow. The fluids of inflammation were there, but the pus which appeared was without explanation. The blood was being examined and its constituents studied, but the white corpuscles, the leucocytes, had not yet come into their own. It was not until 1866, the year the battle of Sadowa was fought, that brought Cohnheim to Vienna, where he visited his old teachers, Stricker and Rokitsanski, in their laboratories, where he found them studying the blood corpuscles escaping through the capillaries into the surrounding tissues, that daylight began to appear in modern science. Cohnheim spread the fact that the leucocytes escaped through the capillaries and populated the "humors" with cells which, according to the intensity of irritation, developed into pus cells or the fibrous tissues of healing wounds.

War on many occasions in the world's history advanced knowledge in medicine from the Arts. The Crimea War gave us the principles of modern hygiene by Parkes' studies and investigations, and so Virchow's modern pathology, as the result of the meeting of the Austrian and Prussian medical officers in 1866, after the battle of Sadowa, supplanted the humoral, by the cellular, pathology. Dr. Thomas Henry Green went to Berlin to study under Virchow, and returned to London, where he taught the new cellular pathology of the Berlin school. He proved a wise apostle of the doctrine, a St. Paul in his capacity as a teacher and a writer.

When the writer came to London in 1871 he had the good fortune to come under Green's pathological teaching at Charing Cross Hospital. University College was the only other medical school where the new doctrine was being taught, but in three to four years it spread to every school in the kingdom. The writer thereby escaped the dark ages of pathological teaching, the humoral pathology of the Middle Ages, and his mind was not encumbered shaking off the dust of ancient tradition.

"Green's Pathology" was a model textbook, convincing in its statement, and contained no dubious paragraphs, as might have been the case in dealing with a newly devised branch of science. The sentences were terse and clear as the sun, and being founded on truth and exact microscopic investigation, admitted of no discussion or possibility of contradiction. As was the textbook, so was Dr. Green's teaching in the class-room and the post-mortem room. Here a new spirit of instruction was introduced. The fact was that not only a great teacher had appeared, but the subjects being based upon scientific truths, led the students along paths consisting of true scientific guidance. In previous post-mortem days the investigation ceased when the seat and nature of the cause of death were unfolded. These rough post-mortem inspections were alone sufficient

to satisfy the investigators of the cause of death during the old regime; now under the modern regime each organ came to be looked at carefully, and pieces of the tissue preserved for further hardening, cutting, staining, &c. The stomach and intestines in typhoid were no longer slumped into the post-mortem trough, but the tube was slit from end to end, the typhoid ulcers noted as to their position and extent, their transparency viewed, perforations looked for, and submucous hæmorrhages recorded, and so on, every organ was examined in detail. Attendance of a student in the post-mortem room was recorded, and neglect to be present or to be late regarded as a delinquency, and came to be seriously considered when "signing up" certificates even were required. What a change to pre-Green-pathology days in the training of students. Lymphatic glands were incised and examined, bones were sawn, and their medullary cavities exposed and parts microscopically examined after mounting and staining, &c. The brain, spinal cord and canal was made the subject of investigation. In fact in the seventies of last century the post-mortem work became a part of the study of medicine in a manner unknown in Britain until Dr. Green's introduction of Virchow's methods were studied in the lecture room, the laboratory, and the post-mortem room. Signs and symptoms and merely "walking the hospitals" were no longer the only education of the medical student, the post-mortem work was raised to the position of a scientific branch of education; the mere perfunctory inquiries of the coroner's inquest were superseded and modern medicine established. Dr. Green was a pupil at University College, London, of Jenner, who had just separated typhoid from typhus. Watson's classic lectures on medicine had lately been published, Simpson's work on anæsthetics was gaining ascendancy; Syme's surgery was leading the surgical world, and Sharpey's teaching dominated the physiological laboratory. In the midst of these the publication of "Green's Pathology" appeared and untold to astonished schools of medicine the cellular pathology of Virchow. To the modern student it is difficult for him to understand what all this meant. It was nothing less than the death of the centuries old "humoral" and the birth of the new "cellular" pathology. The cell, the leucocyte, and its escape from the capillaries was established and its subsequent doings proved. The humoral, the fluid pathological medium, was now dethroned and the reign of cellular pathology had begun. The simple reign of the leucocyte did not by itself last long. The flood-gates of science had been opened, and all honour must be paid to Green, for he it was in this country who led the way to the realm of multiple organisms which now greets us at every page of pathology.

J. CANTLIE.

ANDREW BALFOUR, C.B., C.M.G., has been invited to occupy a seat on the Council of the Imperial Institute of Health. Dr. Balfour has been wisely selected as a member of the Rockefeller Institute which has been established in this country, and all

who are acquainted with him rejoice to know that the lot has fallen upon our respected and most able countryman. In many varied phases of life and in many countries this accomplished man has visited, studied and investigated. During peace and war, in tropical climates, on sea and land he has been a pioneer, and the promoter and ardent worker in our laboratories in more regions of the earth than any other man of science of our acquaintance.

In early life, whilst yet a student in Edinburgh, he bent turned to literature, and several books of stories and fiction proclaimed his abilities and the public appraised his writings. The race for the possession of this young man's intellectual abilities and scientific attainments lay between these two fields of work and we have had during his career samples of both which have adorned the highest grades in each.

In Africa Dr. Balfour served in the South African War as civil surgeon (1900-1); he served as medical adviser during the Great War in the Mediterranean area, in Mesopotamia and in British East Africa. He was medical officer of health in Khartoum 1904-13, during the important years of the conception and the development of the city, with its 80,000 inhabitants; this was really one of Balfour's greatest achievements. This was combined with the post of sanitary adviser to the Sudan Medical Department, which led to visits to Central Africa as well as to Uganda, Kenya Colony, and other parts of Northern and Eastern Africa. His college honours were many; his thesis for his degree was of a technical nature of note. His book on public health and preventive medicine was written along with Lewis, and the first to fourth reports of the Wellcome Research Laboratories at Khartoum are a monument to his work of the initiation of modern medicine in the Sudan. The long and painstaking development of the Wellcome Museum in London, under Balfour's charge, constitutes a technical and scientific exposition of hygiene and its progress met with in Africa.

Balfour's writings, novels, travels, scientific zoological, and botanical articles, are well known and appreciated. His novels have had a wide circulation and he can always find a ready publisher. His latest paper on the problem of acclimatization, given at St. Bartholomew's Hospital, and published in our foremost medical journals in August, 1923, show his wide grasp of tropical life in all its many bearings in a subject which Balfour has made his own. We cordially congratulate the authorities of the Imperial Institute of Health upon their wise choice, from amongst the large and extending group of scientists in tropical medicine, of Andrew Balfour. J. C.

Annotations.

Clinical Investigation of Tropical Sprue (Baile K. Ashford, *American Journal of Medical Science* vol. clxv, No. 2, February, 1923).—The author is of the opinion that the chief causes of the complex symptoms of sprue are presence in the digesti-

the of a super-imposed specific organism—*Monilia silosis*—and glandular insufficiency.

In 453 cases of sprue 86 per cent. showed a positive finding for *M. psilosis*, and 124 cases of glandular deficiency examined by laboratory methods were negative for *M. psilosis*.

Some Epidemiological Features of Cholera in the Philippines (S. A. Del Rosario and L. L. Rizal, Far Eastern Association of Tropical Medicine, Fourth Congress, 1921).—It has been found that the agglutinating property of cholera vibrios may be lost or regained under unknown circumstances in cases and carriers, as well as *in vitro*. The loss of agglutinating property of any strain may be taken as an index of a condition of degeneration. The increased occurrence of non-agglutinating vibrios among cases and carriers means low case fatality.

It would be unwise to ignore or disregard the existence of the so-called "non-agglutinable vibrios," and failure to isolate, quarantine or disinfect persons or things so infected or liable to such infection would be a distinctly dangerous omission.

Activity of Various Arsenobenzols in the Treatment of Trypanosomiasis (A. Zironi, *Terapia*, Milan, vol. xiii, No. 48, March, 1923).—In experiments on rats, mice, dogs and rabbits with *T. brucei*, ovarsenobillon and sulfarsenol were found to have only very slight trypanocidal activity and failed to cause the disappearance of parasites. A new Italian preparation, Neoiaacol, was tried with excellent results, subcutaneous injections having better results than intravenous ones.

The Relationship of Excess of Uric Acid in the Blood to Eczema and Allied Dermatoses (J. F. Chamberberg and H. Brown, *Archives of Internal Medicine*, vol. xxxii, No. 2, August, 1923).—Studies were undertaken for the purpose of shedding some light on the etiology of diseases of the skin of obscure origin with the following results:—

In a chemical study of the blood of over 200 patients suffering from cutaneous diseases, great variations in the uric acid content were found. Over one half of the patients had eczema, and in these an increase in uric acid beyond the maximal normal limit (3.5 mg. was observed in 50 per cent. of the cases).

In some cases of pruritis, both general and local, there were likewise high uric acid figures.

Classifying the eczema patients in age decades, it was seen that there was a rising uric acid curve from the fortieth to the seventieth year. This is not evident in the non-eczematous subjects.

The average uric acid content of the blood in male subjects was about 25 per cent. higher than among the female patients. The average age of the males was about seven years more than the females.

The blood of young patients with eczema did not as a rule contain large amounts of uric acid, but there were some notable exceptions.

The cause of the hyperuricæmia is a matter for further study; it is thought that it is to be explained on the basis of renal disfunction.

Patients with psoriasis, acne, urticaria and certain other cutaneous diseases have a lower average uric acid blood content than those suffering from eczema.

It is thought that the hyperuricæmia was ætiologically related to eczema and to pruritis in a considerable percentage of the cases studied.

Appropriate dietary measures have made many of the patients much more rapidly amenable to treatment than patients previously treated without this therapeutic measure.

Study of the Relation of Coffee Cultivation to the Spread of Hookworm Infection (W. W. Cort, W. A. Riley, and G. C. Payne, *American Journal of Hygiene*, vol. iii, 1923).—In order to study the relation of coffee cultivation to the spread of hookworm disease, two areas were studied on coffee estates in the mountains near Utuado, Porto Rico.

Evidence is brought forward that the present degree of human infestation showed a considerable reduction over former conditions, due to the effect of treatment and sanitation.

The heavy infestation was widespread in polluted areas in the coffee near the houses without latrines.

A comparison of the degree of human infestation and soil infestation, at those places where definite centres of soil pollution were found, emphasizes the favourableness of the coffee environment for the development of hookworm larvae.

Evidence of the importance of the washing of the rains in disseminating hookworm eggs and larvae was gained from these areas.

A consideration of the habits of the workers during the coffee picking season shows conditions very favourable for the spread of hookworm disease.

The cultivation of coffee seems to be such an important factor in the spread of hookworm disease in the mountains of Porto Rico that in the development of control measures special attention should be paid to the coffee workers and their environment.

Dysentery, with Reference particularly to the Laboratory Diagnosis, Epidemiology and Treatment (Major J. E. Ash, *Military Surgeon*, May, 1923).

—The author presents the lessons that may be drawn from the mistakes and experiences of himself and others in the matter of the dysenteries in America, the more important of which are as follows:—

(1) Be on the look-out for bacillary dysentery in this country.

(2) Make freer use of polyvalent antidyenteric serum in bacillary dysentery suspects.

(3) Do not be too dependent on a specific laboratory report in making a diagnosis of bacillary dysentery, but have due regard for the true significance of the gross and the microscopic characters of the stools.

(4) Base the diagnosis and treatment of *Entamoeba histolytica* infections on sound and accurate laboratory findings.

(5) Treat intensively and follow up conscientiously with emetine and emetine bismuthous iodide the case of proven *E. histolytica* infection.

(6) Include in the examination of food handlers a search for parasites, especially *E. histolytica* and hookworm, and conscientious attention to routine work is recommended, especially in the observation and recording of clinical data by ward surgeons and nurses and the careful supervision of case records before they are filed.

A Study of Intestinal Parasites in a Small Group of Siamese Soldiers (W. H. Beach and H. R. O'Brien), *Military Surgeon*, May, 1923).—Intensive study was made of the intestinal parasites of 101 young soldiers on active duty in North Siam. The men were examined, treated, and the stools washed. The data are presented. Infection with hookworm and other intestinal parasites is almost universal in one rural district of North Siam. This infection usually is light, but frequently causes vague general disturbances. A large number of worms, accompanied by anaemia, may be found in young men rated as healthy soldiers and on active duty.

The Differential Diagnosis of Dengue Fever and Influenza (E. P. Thurston, *Medical Journal of Australia*, March 3, 1923).—The author gives the characters of each disease and compares the various diagnostic factors as follows:—

(1) The incubation period of dengue fever is from five to six days, while that of influenza is from one to two days.

(2) In dengue fever the temperature often reaches 105° F or 106° F., while in influenza it seldom exceeds 104° F., in the absence of complications.

(3) In dengue fever there are usually some spots on the skin. The most frequent sites are the hands and feet. In influenza a rash is quite exceptional.

(4) In dengue fever pain may be severe, especially in the back. It assumes the nature of neuralgic pains, and is accompanied by pain and itching of the palms and soles of the feet. In influenza there is usually aching rather than acute pain.

(5) In dengue fever the tongue and throat often swell, but ulceration is rare. In influenza an ulceration of the tonsils is not uncommon. The tongue is rarely swollen. Aphthous spots and herpes of the lips are frequent.

(6) Affections of the lungs and bronchi are rare in dengue fever. In influenza pulmonary and bronchial complications are common.

(7) In dengue fever relapses are common and, in addition, there is always a remission of pyrexia for a day or two, followed by a higher temperature than before. It is at this stage that the rash appears on the hands and feet. Relapses are common in influenza, but there are no defervescence and recrudescence.

(8) Peeling of the skin of the hands and feet is the rule in dengue fever. At times it is extensive. Desquamation is very rare in influenza.

(9) Anaemia and long-continued prostration are common to both diseases. Spinal degeneration has been observed after dengue fever.

(10) Acetyl-salicylic acid and other coal tar derivatives are useless in dengue fever. Belladonna may relieve the pain of dengue. For itching and the rash on the extremities, acetate of lead and glycerine are useful. The coal tar preparations are most useful in influenza.

Parenteric Fevers in Egypt (Z. Khaled, *Journal of Hygiene*, vol. xxi, No. 4, August, 1923).—Bacteriological examination of 1,078 enterica-suspect cases showed that 112 (i.e., 10 per cent.) were due to *Bacillus asiaticus* Castellani. In the same series 12 per cent. were found to be due to *B. typhosus* or *B. paratyphosus* (A or B).

The distribution of cases is widespread, both in time and space, and there is no special incidence on sex or age-group.

The symptomatology of asiaticus parenteric fever is detailed and a description given of the causative organism.

There is some group-agglutination relation between *B. asiaticus* and the paratyphoid-Gaertner subgroup.

Parenterica due to "intermediate organisms" other than *B. asiaticus* is believed to exist in Egypt.

Early hæmoculture in all enterica-suspect cases should be considered the diagnostic method *par excellence*. If the blood develops immune bodies as well the diagnosis becomes definite.

Some Principles in the Diagnosis and Treatment of Pulmonary Tuberculosis (J. Alexander Miller, *New York State Journal of Medicine*, No. 5, May, 1923).—The death-rate from tuberculosis in the United States has been greatly reduced during the past twenty years, also the morbidity of the disease. This is undoubtedly due in a large measure to the efficient organization of all classes of the community, in which physicians have played the leading rôle.

In making a diagnosis, it is an error to wait for positive findings in the sputum, as not more than 30-35 per cent. of really early cases of tuberculosis exhibit tubercle bacilli in their sputum, such a delay will almost invariably allow the case to become advanced in the meantime.

Yatren in Dysentery (K. Huppenbauer, *Munch. med. Woch.*, vol. lxx, No. 19, 1923). The author described two cases of chronic intractable dysentery, in which yatren was administered with successful results. Treatment was as follows: A 5 per cent solution was given in 200 c.c. of water after previous clearance of the bowels, the lavage being retained one hour. Yatren pills, containing 0.25 gm. each, are recommended for after-treatment, from two to four being given at a time on two consecutive days in a week.

Abstracts.

NOTES ON CONDITIONS AFFECTING THE HEALTH OF THE EUROPEAN COMMUNITY IN ASSAM.

By CHARLES E. P. FORSYTH, M.B., M.R.C.P.,

President, Assam Branch, British Medical Association,
January, 1923.

THE duties of tea garden medical officers divide into two main branches:—

(i) The charge of the labour and Indian establishment on the different estates.

(ii) The care of the European community, made up of the managers and assistants on the gardens, their wives and families.

Tea companies, as commercial undertakings, are concerned wholly with the male portion of the community, and prior to the engagement of the young assistant for work in Assam expert medical examination at home is essential, and this should be carried out as far as possible by a physician acquainted with the conditions of life the candidate will be called upon to face. Any pulmonary affection, heart disease, tuberculosis or rheumatism must form an absolute bar to a man's employment in the East, and latterly in the case of war-returned men and ex-officers, disabilities from wounds have had to be taken into account. In this class, which may offer absolutely the finest material procurable for the industry, mistakes unfortunately have been frequent, resulting in many cases in grief, loss and disaster. Sufferers from the more obvious disabilities have not been engaged to any extent for tea garden work, but it has been different in the case of these unfortunates afflicted with, e.g., the minor psychoses. Assam is no place for the treatment or cure of "shell-shock," and most medical officers can point to definite instances where this has been overlooked with unhappy results.

The qualities of mind and body desirable in the selection of a candidate are after all clear enough. Physically he should be a fit man with no latent disease diathesis, or failing, able to stand exposure to adverse climatic influences, periods of excessive heat, periods of excessive rain, and mentally he should be of a cheerful optimistic temperament. The monotony of life he may be called upon to endure is at times very marked, and actual garden duty cannot take up the whole of a man's thought and energy, nor is it desirable that it should do so. There must be relief from the tread-mill of work, and here comes in the main value from the health point of view of games and sports. Tennis, golf, polo, besides assisting in the maintenance of physical fitness afford mental relaxation which is of vital importance. A man on a tea estate may keep perfectly fit physically from the actual conduct of his daily work and little else. His mental health, however, requires something more, and this may be found in games, shikar, books, or a hobby such as motor car repairing or gardening. With an active, intelligent interest in his work, a reasonable aptitude or games, the cultivation of a taste for books, shikar

or other outside pursuits agreeable to reason, a man may keep fit and mentally alert and be able to avoid the deadly snares that constantly await the heedless and the idle. It is known that disease and disability in Assam cannot always be ascribed to climatic influences alone. Now and again the rule of Dionysus and the sway of the Paphian Divinity, one or other or both, assert themselves, evils the rational life full of work tempered by play is enabled to escape.

Again work in Assam demands *leave*, and it does not yet appear to have become settled what amount of leave is desirable or necessary. The need in this respect may vary in different cases and under different circumstances, but a good working rule is that leave home for the first time should be obligatory after five years of service and furlough thereafter should be granted regularly every three years. The question of annual short leave or casual leave has no medical significance. Furlough or home leave, however, is on a very different footing, and has a supreme influence on the maintenance of health and the quality of work.

Marriage perhaps is not readily connected with health questions in Assam, and is naturally a matter to be decided upon by each one individually. It is considered, however, that tea companies should not, unless under exceptional circumstances, engage married men new to the country as assistants, nor should directors permit marriage until a man has at least completed his first agreement of five years. Thereafter he should be in a position to decide for himself and the companies should not further interfere, but rather yield their encouragement and exert themselves to remove obstacles. After his first five years the assistant should have acquired a sufficient knowledge of the country to understand fully the responsibilities that must fall to him with regard to matrimony and he should ordinarily be in a position financially to carry out these responsibilities to a reasonable extent. This leads to the consideration of the health of women in Assam, and it must be recognized as an established fact that women withstand life in the tropics or subtropics much less easily than men, and though conditions in Assam can in a general way compare favourably with those prevailing in many other parts of India or the East the effects of climate on the female portion of the community are still marked. The type of woman fit or unfit for Assam is not open to discussion. There can be no selection, as can be and is always to a more or less extent the case with men. A man when he marries can seldom think of the suitability or otherwise of his proposed wife for the country. Only in certain smaller instances does selection come about, as, e.g., in the choice of nurses or governesses or in the case occasionally of a relative coming out to join the family in the East.

In Assam strictly gynæcological affections are probably not more prevalent than amongst similar classes at home, but the strain of life for women falls especially and prejudicially on the nervous system, and continued residence leads to nervous irritability, insomnia and neurasthenia. Relief is found by

periodical visits to the hills, where the increase of social amenities and general change of scene must often be as beneficial as the kinder climatic conditions. Months in the hills, however, can be the reverse of advantageous if there is any tendency to over-excitement, late hours, or the incessant pursuit of amusement. Want or scarcity of useful employment and lack of intellectual effort are detrimental to bodily and mental health in Assam as elsewhere, and it might be said perhaps, with all reasonable limitations, that the more work a woman has to do the healthier she will be. At the same time purely climatic influences cannot be ignored, and prolonged residence in Assam conduces undoubtedly to nervous stability and impairment of vital force both in men and women, and taking it generally the effects are far more rapid and pronounced in the latter. Children again especially suffer, and after 7 or 8 years of age the risk of physical deterioration and mental detriment is markedly great. Growth is unfavourably influenced while frequent fretfulness points to undue and increasing nervous strain. Infants do well in Assam, and flourish up to about three years and their removal to the hills in the rains is unnecessary. Thereafter, however, it becomes essential if the child is fairly to maintain its natural endowment of health, and in the seventh and eighth year, if only for educational purposes, or to escape mischievous associations, home is called for.

Special matters affecting health in general are housing, food and drink, clothing, personal cleanliness and exercise. Residential bungalows in Assam offer a wide choice of design, but essential points for consideration are free ventilation with a through draught in every room, light in plenty without glare, a thatch roof to promote as far as possible an equable temperature, and partial mosquito-proofing. Full mosquito-proofing is thought to be undesirable owing to the inevitable stagnation of air and the false sense of security engendered unless the wiring is thoroughly carried out and properly maintained, two matters by no means easy, but every bungalow should possess a room or rooms protected where the occupants can find a refuge in comfort and safety at any hour. A particularly bad type of bungalow sometimes seen is built on a low "chang," the under portion difficult of inspection or to keep clean, affording ideal lurking places for hordes of mosquitoes. Bungalows should be situated away from coolie lines with servants' houses also at a reasonable distance. Kitchens should be well-lighted, fly-proof, with cement floors and "pukka" drains, and fitted with a cooking-range. It would be well too if tea companies in general could recognize the value of electric light and fans in all garden bungalows. The depressing effects of poor lighting is very great, and fans make for comfort and sleep during the worst seasons.

Little can be said about food. A certain amount of monotony can scarcely be avoided, but endeavour should be made to secure variety while retaining the diet light, simple and nutritious.

Drink.—Fluids are required in plenty in the hot weather to ensure free action of the excretory organs. Alcohol other than a whisky and soda at sundown or

with the evening meal, to which no objection can be taken, is under ordinary conditions unnecessary and to be avoided. At times wine such as Burgundy beneficial with meals as a mild stimulant and promote digestion.

Clothing in the rains should be light, absorbent and such as to ward off chill. It is thought that wool is undesirable and unnecessary, in that it often appears to favour the onset of prickly heat.

Personal cleanliness is ensured by the universal daily bath, which should be warm or tepid. Cold baths are to be avoided. They are not conducive to skin cleanliness and may be intensely harmful to those who harbour malarial parasites, which means usually, the vast majority.

Exercise has already been touched upon. Whatever its nature it should never be pushed to the verge of overstrain or exhaustion.

With regard to special measures against particular disease, one important matter for consideration is perhaps the use of quinine as a prophylactic against malaria. In the case of coolie labour forces the questionable value of the administration of quinine as a prophylactic was very apparent, and it was possible some years ago to demonstrate its ineffectiveness and put an end to a heavy and senseless expenditure, but where the main and important differences arise between a coolie labour force and the European community is in the matter of dosage—the dose of malarial infection and the dose of quinine circulating in the blood to counteract it. The infinitely high standard in the one diminishes to an enormous extent the chance of infection, and it is found that 5 gr. of quinine given daily under all ordinary circumstances is the optimum prophylactic dose. The author has never yet come across an occurrence of blackwater fever in a patient taking prophylactic quinine in the dosage regularly and conscientiously. This dreaded disease arises only in persons who have suffered from repeated attacks of malaria inadequately treated with quinine, or what is much the same thing, treated with excessive doses of the drug at the time of the attack with no persistence in its use. The onset of blackwater fever itself has then been determined by some over-exertion or severe chill.

DERMATITIS FROM OLEIC ACID.¹

By WILLIAM H. HAILEY.

DR. MILLER B. HUTCHINS often makes the remark that "there are about as many causes for dermatitis as there are cases." The following case is of interest in that the sufferer pursues a common occupation.

History.—Miss N. M., a stenographer, aged 21, complained of rough finger tips of eight months' duration, which cracked open, causing great inconvenience and pain. She had been receiving violet-ray treatment three times a week, without improvement. The remainder of the history has no connection with the present condition.

¹ Abstract from the *Archives of Dermatology and Syphilology*, vol. viii, No. 4, October, 1923.

Examination.—There was an erythematous scaly dermatitis, with an occasional fissure, which was confined to the palmar surface of the distal phalanges of all the fingers and both thumbs. She had no other skin condition, except a small amount of acne, which was worse during menstruation.

Questioning revealed that the dermatitis developed after she began stenographic work. She said that in her work she used a milk-coloured liquid called "Dermax." This was painted over the stencil sheet, she then picked up the sheet and placed it in the typewriter. A companion who did the same work suffered from the same trouble.

According to the manufacturers, "Dermax" is composed of diluted turkey red oil and glycerin. From Dr. Carl Green, a chemist, it was ascertained that turkey red oil is oleic acid, a by-product in the manufacture of soap. He stated that oleic acid is an irritant, and could cause dermatitis.

Treatment.—The patient was advised to use rubber finger cots while doing stencil work. She was given a mild salicylic acid ointment to hasten peeling and to heal the fissures. Recovery was immediate.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 9, September, 1923.

The Dengue Sand-fly Fever (J. W. D. Megaw).—The recently reported discoveries of spirochaetes in fevers belonging to the dengue sand-fly fever group by Couvy and Whittingham give grounds for the hope that the existing state of confusion in connection with these diseases will shortly be cleared up and that a rational classification of the short fevers, based on the characters of the virus, will be available.

Recent literature on the short fevers shows that a most undesirable degree of complication has been imparted to the subject: there are many articles in which "new" fevers have been described under a great variety of names: some of these suggest that the new fever has a definite duration: "Three," "four," "five," "six," and "seven days" fevers "have been described: other writers apply the name of the place in which the outbreak has been seen and so suggest that the disease is peculiar to that locality.

The claim for discovery of a new disease would, in most cases, have been recognized to be unjustified if the authors had been aware of the following facts in connection with the fevers of the dengue group:—

(1) Fevers of the dengue sand-fly group may last from one to seven days, very exceptionally longer.

(2) These fevers show a great variety of symptoms, not only at different times and in different places, but also in the cases of the same outbreak: in fact, the only common clinical features of the group are their sudden onset and short duration.

(3) The fevers of the group are extremely common and widespread over the tropical and sub-tropical world.

(4) They may occur as sporadic cases in an endemic area, or as intense epidemics, according to circumstances.

All outbreaks of fever of short duration should be placed provisionally in the group unless there are good reasons for excluding them. It is not suggested that all short fevers should automatically be regarded as belonging to the group and that no attempts should be made to isolate new and distinct fevers; it is quite certain that most of the descriptions of new fevers would never have been written but for the misleading and one-sided descriptions of dengue which are found in the textbooks. If dengue is regarded as a disease in which break-bone pains, a two-phase fever and a secondary rash are essential features, it is not surprising that medical men should have looked upon outbreaks of fever in which these characteristics are absent as being distinct diseases.

The close resemblance between dengue and yellow fever has long been observed; this consists not merely in the epidemiology of the diseases, but also in the general features.

The relationship between the dengue group and the infective jaundice group is less close, especially as regards the means of transmission of the infection.

The Treatment of Malaria by Quinine in Combination with Magnesium Sulphate and Alkali (J. A. Sinton).—In any treatment of malaria for general use there are two points to consider: first that the system of treatment should destroy all parasites in a large percentage of cases; and, secondly, that it should be practicable for use on a large scale.

The essential features of such a treatment are as follows: it must cause a rapid cessation of the patient's symptoms; it must destroy the parasites in the peripheral circulation, and prevent the appearance of sexual parasites, so making it impossible for the patient to act as a carrier: it must prevent the recurrence of clinical symptoms with the reinvasion of parasites; it must prevent the occurrence of "quinine fast" parasites, if such really do occur: and, finally, it must cause no harm to the patient. For popular use in India, quickness of action and cheapness may be added.

By giving three preliminary doses of alkali before the commencement of quinine treatment it was hoped to combat any "acidosis," to alleviate "anaphylactoid" symptoms, and to make the blood reaction more favourable for the antiparasitic action of the quinine when given.

As the malarial parasite is believed to be most vulnerable immediately after sporulation has occurred, the length of treatment was fixed at one week so that in the case of tertian fevers, at least, quinine would be present in the blood in curative doses on at least three occasions when the parasites were sporulating.

It is quite probable that in more chronic cases such a very short course of treatment may not eliminate all the parasites in the internal organs, such as the spleen, where in its enlarged and congested state the reaction of the blood might be very unfavourable for the action of the drug. In such cases it is probable that two or three courses each of a week of treatment, with weekly intervals, would be needed to obtain the best results. In the interval a tonic mixture should be

given. The following mixtures were used in the treatment:—

Alkaline Mixture.		Quinine Mixture.	
Sodium bicarbonate	60 gr.	Quinine sulphate	... 10 gr.
Sodium citrate	... 40 gr.	Citric acid	... 30 gr.
Water to	... 1 oz.	Magnesium sulph.	... 60 gr.
		Water to	... 1 oz.

Representing one dose of each mixture.

The Failure of "Bayer 205" in the Treatment of Kala-azar (L. E. Napier).—It has for some years been fashionable since the discovery of the causative organism of kala-azar, to associate this disease with sleeping sickness, more especially in respect to its treatment. Pathologically there is practically no similarity between them and, although both diseases are caused by protozoa, from a protozoological point of view, there is little ground for association.

When the remarkable trypanosomicidal properties of "Bayer 205" were demonstrated, high hopes were entertained that this drug would simplify the treatment of kala-azar. In four cases of this disease the drug was tried. Treatment commenced with the minute dose of 0.01 grm., increasing the dosage slowly up to the maximum dose of 0.5 grm. in one case. There was no reaction after the injections, which were continued up to ten injections in one case, totalling 2.115 grm. None of the cases showed any clinical improvement and in each case Leishman-Donovan bodies were found in the spleen puncture material at the conclusion of the treatment.

The Schick Test and Immunization by Toxin-Anti-Toxin in Assam (E. C. Fox, E. J. McDonald and T. C. McCombie Young).—In so far as is known this is the first attempt to make use of the Schick test and toxin-anti-toxin immunization in India, and experience seems to indicate that toxin for the Schick test and the toxin-anti-toxin mixture can, although not always, retain its potency after a journey to India during the hot weather months and give similarly useful results in India to those reported in Europe and America.

The Effect of Intravenous Injections of Antimony Tartrate upon the Development of Vaccinia Virus (J. Cunningham and J. A. Cruickshank).—The results of the experiments show that the intravenous injection of potassium antimony tartrate has no effect upon the development of vaccinia in the calf. It is therefore more than likely that it has little or no effect upon the development of the virus of variola in the human subject. It should be pointed out that the experiments in question were performed during the months of May and June, the least favourable time in Madras for the production of vaccine lymph on the calf. The amount of pulp obtained in each calf was reduced five-fold below that obtainable in the cool season. Under such unfavourable conditions a total inhibition of growth in the experimental calves might legitimately have been expected, had the antimony any inhibitory effect whatsoever. This was not the case however. It can only be concluded therefore that antimony tartrate has no effect upon the development of this particular type of virus.

Correspondence.

To the Editor of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIR,—I was considerably surprised in reading Dr. Fletcher's article on the administration of quinine per rectum in your number of July 2, and I cannot help stating that his emphatic condemnation of the method is contrary to the practice of most practitioners in British Guiana, where this method has been in use for over twenty years, as far as my personal knowledge goes.

Conditions in most of the districts in this colony are such that but for this prompt method in exhibiting quinine in the numerous cases of infantile convulsions due to acute malaria a larger number of fatal cases would probably occur.

My own experience has been with the ordinary acid solution of sulphate of quinine with the addition of pot. brom. or chloral hydrate; a simple soap and water enema is given previously and 5 vi or 3i of a solution of quin. sulph. (gr. x ad 3i and pot. brom. gr. x ad 3i) are introduced into the rectum with an ordinary glass syringe with the patient on the left lateral or the prone position: it is remarkable how quickly the convulsions cease and quiet restful sleep induced, sometimes within five minutes.

There is sometimes an effort at expulsion of the mixture, but when this takes place a second injection is given and the buttock held tightly.

I have never seen or heard of the sequelæ which Dr. Fletcher records, and I certainly think that this quick method is a great boon to the busy district medical officer in remote districts without trained assistance and the means of effectively sterilizing syringes and needles required for intra-venous injections of quinine salts; these may be at right in well-appointed hospitals, but are out of reach of the isolated district medical officer.

I was pleased to read Dr. Newham's letter in your issue of August 15, and I agree with each of his statements.

I am, Sir,

Your obedient servant,

Q. B. de FREITAS,

M.R.C.S. Eng., L.R.C.P. Lond.

British Guiana Medical Service,

New Amsterdam,

September 24, 1923.

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Original Communication.

THEORETICAL SUGGESTION AS TO THE CAUSE OF SO-CALLED "BLACKWATER FEVER," AND A FEW NOTES ON TREATMENT AND PROPHYLAXIS.

By Dr. W. A. Youse, W.A.M.S.

Clinical Pathologist, Lagos Hospital, and Assistant Bacteriologist, Medical Research Institute, Yaba.

[All that is said in the following paper refers to the subtler variety of malarial parasite and to West Africa.]

On reading the literature available to one on blackwater fever, the characteristic which presents itself most is the way in which most writers, in different ways, state that although nearly every-pointing points to malaria being the cause of blackwater fever, they feel called upon to suggest that this is merely a "catch" in medical ætiology and that there must be some other cause.

Castellani and Chalmers definitely state it is a *sensu stricto*, although their definition of inine hæmoglobinuria seems capable, to my mind, of being the definition of blackwater fever so.

Manson-Bahr would appear to think malaria is the cause, but attempts to convince himself and others that it is not.

McCay suggests the action of the sulphate part of quinine, but Castellani and Chalmers have demonstrated that equinine-tannate and hydrochloride of quinine can all cause hæmolysis.

Balfour suggests an unknown toxin injected by an unknown insect or other arthropod.

Cleland suggests anaphylaxis.

There has also been the piroplasma idea, though the parasite has never been seen either ante- or post-mortem.

Stephens, however, is convinced that malaria is the primary cause, quinine being an adjuvant, only acting in the presence of a third and unknown factor or under certain necessary conditions.

Byom and Archibald in their textbook (which has not come to hand) approve of the ætiological relationship of malaria and blackwater fever.

My whole experience of over nine years in West Africa has convinced me that blackwater fever cannot occur without previous malaria. At the same time one is mystified at the apparent unreasonableness of it occurring in one case and not in another, where it would appear more natural for it to do so.

In what follows I have attempted to show how, in my opinion, blackwater fever might occur, and how, granting it does in that way, its peculiar characteristics might be also explained.

Of course, the necessary factor may be merely a peculiar condition of the patient—his red cells may be pathological, even as the hæmophilic is. The judicious use of alcohol may be another; untreated or badly treated syphilis also.

But it appears possible that malaria hæmoglobinuria might occur in an otherwise healthy patient, and it is particularly his case I attempt to deal with.

How the quinine in itself acts is left to the biological chemist to settle.

Barrat and Yorke, however, have demonstrated the action of quinine in alkaloidal form, also in the bihydrochloride as well as hydrochloride and hydrate forms upon healthy red cells, and state that:—

(1) All produce hæmolysis.

(2) In equimolecular concentration the hæmolytic power is the same.

(3) During life it is not possible to reach a percentage of quinine in the blood sufficient to cause hæmolysis owing to the toxicity of the drug.

After one has examined more than ten thousand blood films, stained by the same method and, allowing for the personal equation, in the same manner, there are features which, being constantly present to a more or less extent according to the conditions, are bound to impress themselves on one's mind.

In this instance a particular characteristic is the peculiar bluish staining of certain erythrocytes in certain malaria bloods known as the condition of polychromasia or polychromatophilia.

In this paper these cells will be designated throughout as polychromatocytes.

In the staining of these films, the usual method used has been that of Romanowsky (Leishman's modification), and to a less extent staining overnight with 1 in 25 diluted Giemsa.

In either case the slide has always been washed in a strong flow of tap water. (The water supply is excellently pure both chemically and bacteriologically, and, as a rule, of neutral reaction.)

In such films the polychromatocyte appears of purple blue, in which the blue greatly predominates. It may be of the same size as the healthy red cell, but is often larger, and often broken at one side. It gives one the impression of being anæmic, unhealthy and cyanosed.

Polychromatocytes are not always found in malarial bloods; they are not found in healthy adult bloods; healthy adults taking the correct prophylactic dose of quinine never show them.

Adults who are not taking sufficient quinine as a prophylactic dose (i.e., where a very few parasites manage to survive and sporulate) show such cells repeatedly.

They are characteristic of acute malaria a few hours after a rigor—always of chronic malaria—always of acute attacks not sufficiently treated by quinine—which may be classified as chronic malaria in a European. They are exceedingly scanty or not seen at all in films of blackwater fever cases taken shortly after the attack, but are seen some days later when malaria parasites are also to be found.

In other words, polychromatocytes are a product of malaria and a diagnostic feature thereof, and

because they are, according to the theory I am going to offer, it is only right that they should tend to disappear at the period of a blackwater attack.

What is the origin of the polychromatocyte? Three suggestions offer themselves.

(1) As the result of the anæmia immature cells enter the circulation. Red bone marrow does not necessarily show such cells when healthy. According to Carnegie Dickson, polychromatocytes are a regular stage in the genesis of red blood cells in the bone marrow. They have been described in "anæmia" cases. In some cases they may be the result of an increased and early production of red cells, but it is also possible that they may be the effect of the toxin causing the anæmia on the marrow. If it were a case of immaturity one would expect to see nucleated red cells more often. As everyone knows a normoblast is relatively rare, while polychromatocytes are very common.

Again, the normoblast usually stains correctly, indicating that it appears in the blood after the toxin effect has been minimized (here I refer to malaria only). But the cells, although polychromatic, do not appear under the microscope to be the same as those in malaria.

The malarial polychromatocytes appear bluer. This may be purely a personal point of view, however.

In Delafield and Prudden's "Textbook on Pathology" it is stated that, as polychromatophilia is a condition of the immature cell and also of the toxicated cell, our stains are not yet able to differentiate between the two.

(2) The reaction occurring due to an attempt of the malaria parasites to enter or attach themselves to the cell. Against that, as a common occurrence, is the fact that most cells containing parasites stain well (the toxin being within the parasite itself and so unable to damage the host), while polychromatocytes seldom contain parasites, though they may do so. This applies to milder infections especially.

(3) The colouring is due to the effect of the malaria toxin. This appears to me the most likely solution and can be shown experimentally. Washed human red cells, when mixed with the correct proportion of serum containing malaria toxin and incubated for half an hour at body temperature on staining, show a typical polychromatophilia; all the cells are not equally affected and many escape, so that age or other factors may have to be taken into consideration, also in making a film the polychromatocytes are found to fracture readily as compared to the healthy-looking red cells around.

Under the pathology of malaria, Delafield and Prudden state that malaria toxin has a marked effect on the erythrocytes, especially those not containing parasites, as is demonstrated by the polychromatophilia and granular degeneration of many red cells.

Thus the polychromatocyte would appear to be either a damaged or reacting cell, or both.

What becomes of these cells? Physiologists

reckon the length of life of a red cell is about 120 days; that means that about one-tenth of them must be destroyed daily and no hæmoglobinuria results that can be demonstrated. (See Howell "Physiology.")

As to whether there is a definitely selective action on the part of the body, e.g., choosing the oldest cells for destruction, is not known.

According to Gruner, there is no evident difference in the appearance of a red cell about to be phagocytosed and one apparently in full activity. Young cells are more resistant to lysis.

However, if there is a selective action, the possibly the polychromatocytes are destroyed. The usual amount of blood is destroyed daily, and also the polychromatocytes, then, unless the body is capable of dealing with more than the usual amount of Hb., the excess must appear in the urine.

Now this hæmoglobinuria only happens in severe pernicious malarial cases where there is considerable cell destruction, so it seems possible that though the polychromes may be destroyed the extra Hb. is used in the body's economy, e.g. extra bile formation and bilirubin.

Of course it is also possible they recover. In very mild case of malaria well treated with quinine they may all disappear in forty-eight hours. In some films nearly every blood cell may show this condition; especially does this appear so if quinine has just been taken. If such number were for destruction one would expect hæmoglobinuria, also when red cells having polychromes amongst them are incubated in healthy serum the polychromes show a tendency to stain better.

Why should only a cell here and there be affected?

(1) Some cells either older or not so strong may be more vulnerable. The experiment of cell age in serum suggests this, as only some cells are affected. (2) The degree of toxicity probably accounts for healthy cells being injured.

It is in the internal organs, lungs, spleen, &c. that sporulation mainly takes place. That means that at the time of the access the toxin must be very concentrated. Now the erythrocytes in the immediate neighbourhood, healthy or otherwise, would be steeped in this poison and most likely those in the highest concentration actually lysed, those further away being only damaged, and later these latter enter the circulation.

The toxin that enters the peripheral circulation is much diluted, and so evidently does not affect adult healthy red cells. (Wade Brown's experiments show that alkaline hæmatin—which I think is the same as the malaria toxin—causes actual lysis of the cells.) Thus healthy, strong erythrocytes not in the vicinity of the malarial explosion remain unaltered.

We may take it, therefore, that red cells grow old and are got rid of normally and the Hb. is represented by the bilirubin, but when an individual is infected by parasites which feed on his red cells

much greater destruction takes place, and when the liver is not able to deal with the debris hæmoglobinuria results, the kidney gets clogged, and we get what is called blackwater fever.

Does this condition naturally arise in malaria?

It does both in the native and the European. As a rule, however, when no quinine is taken, death occurs before this stage owing to cerebral complication or hyperpyrexia. That it must occur can also be shown theoretically.

Plasmodium falciparum gives rise to thirty-two merozoites.

To err on the safe side, let us allow that by some means or other twenty-four succumb, and of the oxin three-quarters is neutralized (a doubtful supposition, since an injection of malarial serum, small in quantity and diluted with a total new blood, can cause the symptoms of a malaria toxæmia).

This leaves as the result of sporulation $8p + 8t$.

Let us suppose the number of parasites in the system to be X . Then, after the first sporulation, there will be $X (8p + 8t)$; second day $= X (8^2p + 8^2t)$; third day $= X (8^3p + 8^3t)$, &c.

Which means the rate of destruction of the red cells containing parasites is increasing by a geometrical progression. This can be worked out, and shows that one parasite can eventually cause the destruction of 2 million red cells in seven days.

Let the microscopic field show every tenth cell infected on the first day of examination; then, allowing the total red cells of the body to be between 15 and 20 million millions, it can be easily calculated that the total red cells can be destroyed in thirty-five days.

But if we take into account the lytic effect of the toxin as well, the period required for total destruction will certainly be less than half.

Now the human body cannot regenerate at anything like this rate of destruction. The regeneration proceeds at a rate akin to arithmetical progression in which the "d" factor is a small unit.

Consequently, the result must be a hæmoglobinæmia and hæmoglobinuria and death.

As remarked before, this occurs in Nature. Untreated natives who have some immunity, or, as some prefer it, tolerance, with a severe infection and not treated with quinine, may become the subjects of blackwater fever, though this is not often seen, because such patients are more likely to die of cerebral malaria or hyperpyrexia (toxæmia).

Though this stage is reached before marked hæmoglobinuria results, nevertheless icterus and a faint trace of Hb. and urobilin in the urine are often present, which means that very mild blackwater fever is indicative of a severe attack of malaria, which to me does not appear the "untenable paradox" mentioned by Manson-Bahr.

Thus it appears legitimate to argue that blackwater fever must necessarily follow severe untreated malaria provided the patient survive long enough.

Why, then, is blackwater fever so relatively common in Europeans? Quinine is the reason.

Let us take one organ in the body only, e.g., the spleen. It has an artery and vein, it is spongy, and to make an increase or decrease in the blood flow has the power of contracting once a minute. In some malarial spleens strong fibrous bands are met with which may prevent complete clearing of the organ and account for some latent affections.

Passing through the spleen are red cells; in every twentieth cell let us suppose a parasite about to sporulate. Sporulation takes place, 5 per cent. red cells being destroyed by the act. The toxin is concentrated, therefore another percentage of cells are lysed, and the probability is that twenty cells would be lysed, as around one cell there can be at least twenty other cells, and if the hæmoglobin hæmolyses one, it must on an average hæmolysed the others, but to err on the safe side let it hæmolysed only five; therefore total destruction must be 30 per cent. red cells in the spleen. But others not hæmolysed are damaged to a greater or less extent according to their proximity to the parasite-containing cell at the time of sporulation. Quinine 20 gr. is taken. Quinine is a protoplasmic poison. To healthy red cells in that dilution quinine is not visibly so, but the suggestion naturally arises that on these damaged cells it exerts its poisonous effect, and of the fifteen surrounding red cells left another five might be destroyed.

Polychromatocytes in a film after immersion in the body dilution of 20 gr. quinine stain a deeper blue; that means nothing definite, of course, except that the quinine does have some direct action on the cell.

Thus in the spleen 60 per cent. red cells have been destroyed. This has also taken place in the liver, brain, lungs, &c. Now all the internal organs accommodate more than half the total blood of the body. Thus we have of the total blood some 30 per cent. destroyed, which is far above the daily healthy destruction, and more than the body can deal with, and so blackwater fever ensues.

This brings me to the statement that blackwater fever is merely a symptom of pernicious subtertian malaria (not even a complication, as it is always occurring internally, but as it only occurs outwardly on occasions the term complication might be better), and this complication may become premature by the exhibition of a large dose of quinine. Although there is usually a history of irregular taking of quinine in blackwater fever cases, this may not have any special action in itself beyond perhaps of making some parasites quinine-resisting and so making the type of parasite more virulent. Although it is also possible that irregular quinine taking allows the parasites to multiply to such an extent that they destroy red cells so steadily that the bone marrow is taxed so severely that sooner or later it turns out defective red cells; but the malaria could cause this without the help of irregular quinine.

This explanation would account, therefore, for two well-known and puzzling phenomena.

(1) The scarcity, amounting sometimes to apparent nullity, of malaria parasites in the peripheral blood after a blackwater fever attack, and (2) for the disappearance of the polychromatocytes. Again picture the spleen; it is full of disintegrated red cells, the merozoites are in serum which is inimical to them of itself, and because of the quinine—macrophages—mononuclear leucocytes are devouring them; owing to the debris they are not easily or at all carried into the splenic vein, and thus they become an easy prey; and it is also possible that concentrated toxin may be harmful to themselves, which may help explain the difficulty of growing a second crop of parasites *in vitro* under the conditions first stated. We ourselves excrete material which can be poisonous to us.

(2) The quinine has destroyed most of the polychromatocytes and so few escape into the general circulation. Hence my contention is that for the production of the symptom or complication of "blackwater" in Europeans it is not so much the question of the number of parasites, but the amount of toxin set free which, together with the poisonous effect of the quinine on the polychromatocytes thus made, produces a quantity of Hb. in excess of what the body can deal with. This would explain why the intensity of "blackwater" varies, since it must vary directly with the amount and virulence of the toxin operating, and to a less extent directly with the amount of quinine.

By that is meant that other factors being equal: $X \text{ toxin} + Y \text{ quinine} = n \text{ polychromes lysed}$ may equal blackwater. $2X \text{ toxin} + Y \text{ quinine} = 2n \text{ polychromes lysed}$ will be blackwater fever. $X/2 \text{ toxin} + 2Y \text{ quinine} = n/2 \text{ polychromes lysed}$ may not mean blackwater fever, because the toxin has not damaged a sufficient number of cells to a sufficient extent for the extra quinine to work on.

CLINICAL EVIDENCE.

For several years now records of all blackwater fever cases in Nigeria have been specially prepared. These (over 200) nearly all give the same history—anopheles present, irregular taking of quinine, irregular fever, a final bad "go" of fever, and a big dose of quinine. This history is so common as to be monotonous.

In all blackwater fever cases I have seen or dealt with myself there has always been a definite history of indefinite periods of fever. In all the cases whose blood I have examined recently, i.e., fifteen cases (1922), I have found malaria parasites after the attack, and in some before the attack. One film recently showed a parasite in every fifth cell in one field. Next morning the lady had blackwater fever. She had also had quinine.

I think I am quite right in saying that the above opinion is held by all the members of the W.A.M.S. who have dealt with blackwater fever cases. Again, the post-mortem appearances of the bodies of blackwater fever cases are essentially those of any malaria case plus the natural results of the added symptom of hæmoglobinuria, e.g., jaundice, hæmo-

siderin in the liver, and enlarged kidney having the tubules blocked.

Malaria also, sometimes in relatively mild cases, has its effect on the kidney, causing albuminuria and the presence of casts. In such a stage it is not to be wondered at the kidney being quite unable at times to deal with the Hb. excretion, and so mechanical blocking occurs.

It has been put forward that as the manifestations of malaria are manifold, while those of so-called blackwater fever are always the same except in its intensity, therefore they must be different diseases. The fact of the sameness of the so-called attack suggests rather that it cannot be a disease of itself but a complication, and as complications do always vary in intensity in different patients, it appears to me that the complication idea of blackwater fever is strengthened. For example, take chronic Bright's disease; it may develop either of three endings: (1) Uremia; (2) cardiac failure; (3) hemiplegia. Each may vary in intensity, but each in itself is the same; but because of that they are not regarded as separate diseases—they are merely complications resulting from the toxæmia of Bright's disease.

Many cases of malaria occur without blackwater fever, but no blackwater fever ever occurred in West Africa without previous malaria.

The argument "that tuberculosis occasionally follows typhoid, but one does not regard it as being caused by typhoid" is futile, since hundreds of cases of tuberculosis have never had typhoid.

But I repeat, no blackwater fever ever occurs in West Africa without previous malaria.

The value of what a certain type of patient says regarding whether he has had malaria or not is of no value. Repeatedly I have had a patient say "he never gets malaria." "Oh, yes, he has fever but never malaria," and one examines his blood and finds rings without difficulty.

The old coaster who says he has never taken quinine is seldom to be believed, and if so, is merely an example of the survival of the fittest. He never cares to tell you how many of the coasters whose funerals he has attended died of fever, with the added complication of blackwater.

That the subtertian parasite is the necessary variety to produce the special type of toxin is suggested by the knowledge that where subtertian malarial infection is commonest, "blackwater fever" occurs most frequently. Where other varieties of parasite are accused, there is usually no definite information given as to whether the subtertian variety could be entirely eliminated.

To summarize:—

(1) In West Africa no authentic case of blackwater fever ever occurs or occurred without previous history of malaria.

(2) If a sufficient number of films are examined in such cases, malarial parasites can be found in more than half the cases before and after the attacks.

(3) The post-mortem findings are similar to those of malaria with the added symptom of hæmoglobinuria and its results.

(4) The malarial parasite (*P. falciparum* in West Africa) is the primary cause (no definite statement is made re tertian and quartan, as we have little knowledge of them here, but personally I have never found them in a blackwater fever case). The toxin produced thereby is the more potent agent; quinine merely makes the attack premature when a certain percentage of red cells have been damaged by the toxin.

(5) Blackwater fever should be replaced by the term Malaria hæmoglobinuria. It is only a complication.

(6) The polychromatocyte is of diagnostic value in examining films, and it is from this cell that this theory and argument are deduced.

IMMUNITY.

I have often heard it remarked that there is no immunity in the case of malaria, only a tolerance. That there must be more than a tolerance to malaria is shown by the native and the old coaster. Tolerance suggests the idea of symbiosis.

If that is the case, then as the infection increases here should be no symptoms, or is the tolerance supposed to depart then?

A good example of immunity is given by the following:—

A well-known Yoruba gentleman went to England to study for the Bar and was away ten years. Before he went he occasionally had very mild attacks of fever, but a purge cured him. When he came back he had the typical attacks of a European, but his ancestry and his own natural reaction soon restored his old relative immunity. It is stated that it must be tolerance, because parasites can be found in most natives; but it must be remembered that they are constantly being infected and they take no quinine, use no mosquito nets, and the older they become the fewer are the attacks—if any.

The old coaster has reached this stage to a less degree, but he has been fortunate to do so in one generation. This brings one to a very interesting problem. Should natives be treated with quinine as a matter of routine, and should the educated natives use prophylactic quinine? If I were the individual in question, I admit I may be inclined to say "Yes," but from the race point of view I have no hesitation in saying "No," unless, of course, sanitarians can guarantee that at least 90 per cent. of mosquitoes can be kept under. Firstly, natives have a natural ancestral or hereditary immunity, and secondly, an acquired one obtained from childhood. Why spoil it by using prophylactic quinine and decreasing then the immunity? Since it is impossible at present to eradicate mosquitoes and impossible to get all the native population (it is difficult enough to entice a white population) to take quinine, it seems to me to be better that all should preserve their immunity as

much as possible, and quinine only be exhibited in the case of an attack which is dangerous to life or hinders the patient's recovery from another malady.

At home measles (compared to what it was and what it is on virgin soil) is a relatively mild disease. It is so because of our phylogenetic immunity to it, and in time it should die out, other factors being equal.

It has been suggested that all the pupils in the native boarding schools should be prophylactically treated with quinine. What will happen afterwards? A few may try to spread the lesson of prophylaxis in their native villages, but most will resume the old customs, and when they become infected either react very severely or perhaps die. In Sierra Leone the average case of native malaria was treated with a purge only, and he invariably got better without further trouble.

TREATMENT AND PROPHYLAXIS.

An acute attack of subtertian malaria in a patient who has not been having fever off and on for a month or more can only be treated in one way, i.e., by giving sufficient quinine quickly till all the parasites have been destroyed, and blood films are negative on several successive days, and no polychromatocytes are seen.

These cells appear to be in evidence more when a patient is being treated, since they are often seen in the film when no parasites can be found (at least not easily), though they may be in the internal organs.

In the case of the chronic malarial patient one is dealing with a potential case of blackwater fever.

If badly infected, possibly any small amount of quinine will cause the hæmoglobinuria, and one is between the devil and the deep blue sea. However, there is one thing certain—if it is possible he must be treated in hospital; and if the theory outlined above is correct, then he should be treated with an initial small dose of quinine, increasing daily. It should be given intramuscularly for preference, since gastritis will be present and the muscle method allows of a slow and sure absorption, if given properly.

The idea is that since the toxin kills more cells than the sporulating parasites, and a certain percentage of quinine is necessary to kill the polychrome cell, for every parasite killed by the quinine the toxin has decreased probably five times as much. In this way a stage is reached when large doses can be given, since there are few unhealthy polychrome cells about.

But what about the patient who has got blackwater fever? His quinine treatment must go hand in hand with the microscopic findings.

Firstly, there may be no polychromatocytes and no parasites. It is possible that the malaria infection has destroyed itself, therefore there is possibly no need to give quinine at this stage.

Recovery may follow without any parasites appearing and no exhibition of quinine; but if he

has parasites or polychromes, then the treatment is as for chronic malaria.

Relapses may occur, but if done judiciously no danger ensues.

I give one example which occurred recently:—

A patient came into Lagos Hospital in a very critical state, and it was very doubtful if he could survive the next twenty-four hours. The following day a film showed parasites and his chart a rise of temperature. I suggested the above treatment; he had two slight relapses afterwards but otherwise was very fit, able to be up at the end of two weeks. Of course he had all the other usual treatment as well. A film at this period showed no polychrome cells and no parasites, and he had no more fever while in hospital.

PROPHYLAXIS IN THE EUROPEAN.

The destruction of the mosquito and the use of the mosquito net and other such auxiliaries are acknowledged everywhere as of the greatest value.

The question of quinine prophylaxis, however, is another matter. Every layman has his own idea and opinion, and he will blame anything from bad water and draughts to overwork and "sun" to account for his "go" of fever, and possibly there is some reason in his unreasonableness, as I shall try to show.

He takes 5 gr. quinine daily and the mosquito incidence is small—he keeps fit. He does the same again, but mosquitoes are heavily infected and great in numbers, and he doesn't feel up to the mark; *ergo*, it must be the quinine and so he stops taking it, and as he hasn't thought the matter out carefully, not knowing sufficient of the subject, he can scarcely be altogether to blame. And here I want to point out that a prophylactic dose of quinine is not 5 gr.

It is that amount of quinine which prevents one malarial sporozoite surviving in the blood-stream, and, needless to say, this must vary with the weight of infection, the state of health of the individual at the time, and the temperature variation.

At the same time a 5-gr. dose is a useful average dose, and he who has an attack of fever while taking this dose will have a mild attack, and as he takes a prophylactic dose and does not blame the quinine when "off colour," it means that he is watchful of his health, and so will see his medical man and be cured speedily.

In most people quinine is well tolerated, and it is the condition where the malarial infection is barely kept under that the so-called bad effect of quinine is felt. The bad effect is really very mild malaria.

Here is a personal example. I take 5 gr. of quinine regularly (I admit occasional forgetfulness).

Recently there was an unusual spell of very cool weather—a damp cold. I didn't feel just up to the mark—had diarrhoea with slight mucus—not sufficient fever to make me take my temperature, and an irritating cough which I put down to

cigarettes. One day in the laboratory I felt as if someone had suddenly blown cold air down my back for a second. So definite was it, however, I got up and examined my blood. No distinct rings, but a few, for want of a better term, I might describe as small Seidelin bodies on the edge of a few of the red cells; but there were definite polychromatocytes present. I waited a few hours later and found definite rings. 60 gr. of quinine in forty-eight hours promptly returned me to my normal state. The cough went as if by magic and also the diarrhoea. The blood film now showed no rings and no polychromes.

Before this several diarrhoea cases were occurring and put down as possible enteritis of influenzal origin, although, on thinking back, the bloods of those patients I did examine showed polychromatocytes, but I stupidly did not connect the diarrhoea with malaria. It would appear, therefore, that the cold spell lowered the body resistance, thus making the 5 gr. not quite sufficient as a prophylactic.

In some of these cases the findings were very like a mild attack of amebic dysentery, except for the absence of *Entamoeba histolytica*. It is possible that malarial dysentery may be more common than is thought, and quinine cure where emetine cannot.

The idea, therefore, is for all Europeans to have their blood examined periodically (when they feel seedy) to see if their quinine prophylaxis is sufficient, and if they are not in a position to have their blood examined, they should not blame the quinine but double the dose for a few days instead.

Of course there are some places even in West Africa where mosquitoes are so scarce or so scantily infected that prophylactic quinine is not an essential, and a prodromal malaise can be combated by a few doses of quinine. Such places are very rare, however, and only possible during the dry season, e.g., Bamenda Plateau—Buea and Hill Station, Freetown.

CONCLUSION.

(1) The presence of polychromatocytes is of great diagnostic value as to the presence of obscure malaria.

(2) "Blackwater fever" is not a disease *per se*, but only a complication of a severe infection of malaria. This complication, which might occur, and sometimes does if the patient can survive otherwise, is made premature by the exhibition of a certain dose of quinine usually larger than the patient is accustomed to take. Its action on the large number of severely poisoned cells accounts for the explosive character of blackwater fever. It should be called "Malarial hæmoglobinuria."

(3) To prevent malaria, prophylactic quinine must be used scientifically and not indiscriminately.

(4) Any change in the environment or individual health may alter the prophylactic dose required.

(5) Quinine is the only remedy for subtertian malaria at present of any value.

(6) So-called "blackwater fever" is a blot on the intelligence of the community, and should never be seen under normal peace conditions.

(7) Any factor which impairs the body's efficiency may turn a not too severe attack of malaria into one of malarial hæmoglobinuria.

I am much indebted to Dr. Clark, Sanitary Officer, Lagos, for useful information, and to Dr. Quintin Stewart for kindly overhauling the proof.

The Occurrence of the Larvæ of Onchocerca volvulus in the Skin of Natives of the Gold Coast (J. F. Corson, *Ann. Trop. Medicine and Parasitology*, December, 1922).—Numbers of the natives of the Gold Coast were found to harbour the larvæ of *Onchocerca* in their skins, especially those with ulcers of *Onchocerca*. It was impossible, however, to prove relationship with the larvæ and the cutaneous conditions present, such as elephantiasis, ichthyosis, crawl-crawl, &c.

Alterations in the Formation of the Bones in Experimental Beriberi (Dr. Italo Sachietto, *Pathologica*, September 1, 1923).—Young chickens kept under an incomplete diet determining beriberi, for three months, showed the following changes in development:—

(1) A notable decrease in the connective cartilage in the endochondral ossification, and small formation of the bone tissue.

(2) Small amount of proliferative activity in the elements of the periosteum and weak formation of the lamellæ.

(3) Phenomena of deviation from the normal type of consistent ossification, but scarcely any degenerative phenomena occurred.

(4) The lesions differed in each subject according to the diet.

Bacillary Dysentery in Children (F. H. Beare, *Medical Journal of Australia*, March 31, 1923).—The ætiology and symptomatology of this malady are given in detail. It is a common cause of death among children in Australia, a fact which is not generally recognized, and is a more common cause of diarrhœa during the second half of the first year of life than the first half, and is still more common after the first year of life. Children will develop dysentery on any diet, the breast not excepted, but breast-fed children are much less likely to develop the disease than artificially-fed children. Infection is most often obtained, either by personal contact or by means of flies. Horse manure is a potent indirect factor to the spread of the disease, as a favourite breeding ground of flies, especially in the summer months. The Flexner type of dysentery bacillus is the one most often met with in the Adelaide cases; the Shiga type has not been seen in such cases. Every case of diarrhœa with the passage of blood and mucus in the stools should be regarded as bacillary dysentery until proved otherwise.

Treatment with salines and a polyvalent anti-dysenteric serum offer the most promising lines of treatment.

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DECEMBER 1, 1923.

THE VETERINARY SURGEON IN THE TROPICS.

DURING the war veterinary surgeons were in great demand; enlistments for the rank and file of the Royal Veterinary Corps were increased to a degree hitherto unknown, and the nature and

extent of their work advanced beyond belief. Every man familiar with attendance upon horses was searched for throughout the country and recruited into the service. The fresh arrivals from S. Africa, the Argentine, Mexico, and from every "horsey" country were interrogated as to their knowledge of horses, be they for the cavalry, the Army Service Corps, or the guns. Relays of fresh horses collected in home districts had to be shipped to the Continent under the care of horsemen more or less skilled in the management of horses.

Military and civil schools of veterinary training are:—

The Royal Army Veterinary Corps, which has its headquarters at Imperial House, Tothill Street, Westminster, London, S.W.1.

The civil educational teaching schools are at:—

The Royal College of Veterinary Surgeons, 10, Red Lion Square, London, W.C.1; Royal Veterinary College, Camden Town, London, N.W.1. Liverpool: Liverpool University; Royal (Dick) Veterinary College, Edinburgh; Veterinary College, Glasgow; The Royal Veterinary College of Ireland, Dublin.

In the tropical Crown Colonies and administrations for some twenty years a veterinary surgeon has been added to the permanent staff to attend to the horses, cattle, Vaccine Institutes, dairies, dogs and the many wants of everyday life amongst animals. In recent years Vaccine Institutes have been started to supply the local wants amongst Europeans and natives and the maintenance of vaccine placed under the charge of the local veterinary surgeon. The writer, whilst in Hong-Kong in 1891, started a Vaccine Institute which was controlled by a veterinary surgeon brought out from England; this was kept going, and in time sufficient lymph was provided not only for the Colony but also for supplying the shipping which called at the port of Hong-Kong—the largest port of call in the world. The fresh calf lymph prepared was also taken up by the millions of South China, and to-day only those acquainted with the tropics of twenty years ago can appreciate what this means—fresh calf lymph! In the beginning of last century vaccine was brought to China in sailing ships—a six months' voyage—from England to China and the Far East. Later it was carried by the East India Company's smacks from Calcutta to Hong-Kong. Manila had vaccine brought from Spain across the Atlantic, South America and the Pacific to the Philippines, and there by great care by renewed vaccines on the road out was the fresh vaccine imported into that remote land. The good the veterinary surgeon has done by his presence in these and scores of other stations is incalculable. Fresh cow's milk is a necessity for Europeans in every country where they have made a home. Dairies were gradually introduced, and it became a large part of the veterinary surgeon's duties to attend to and watch the breeding and rearing of cattle, attending to their ailments, and seeing to the cleanliness of the

milk, the feeding of the animals, the hygiene of their sheds and their protection by inoculations against "pleuro-pneumonia," segregation of infected animals, and the multitude of attentions which a modern dairy demands.

The expenses of the maintenance of a modern dairy in a tropical country can scarcely be appreciated. The cattle may be brought from long distances. To Hong-Kong and the China coast the cows were originally brought from Canada and the United States coasts; the deaths on the voyage were many from rough weather on the Pacific, from exposure to cold, from insufficiency of succulent and fresh food, from exposure to heat, to infections and bowel troubles.

In Hong-Kong and South China there is no natural fresh grass; there are no sheep in South China owing to the grass being inedible. Hay has to be imported from Australia or America. Rice straw is unsuitable for imported animals, and dairy cattle are hampered in their wants. Can these obstructions be removed? It is a similar fight in every tropical country, and it requires the help of the botanist, the agriculturist, the dairy farmer, and especially the veterinary surgeon to join in their efforts by every help science can afford to render suitable food available for Europeans in their isolated homes, especially the rearing of children when the mother finds the breast milk lessening in quantity and quality before its rational time.

The horse in the tropics as elsewhere is not in so serious demand as formerly. The motor is supplanting much of its usefulness. In Hong-Kong, owing to its hilly nature, the horse has never been called upon as a means of locomotion, and except for racing purposes it is seldom seen abroad. For racing purposes, however, the horse is in goodly demand, and the veterinary surgeon is called for.

The necessity for an increase in the veterinary departments of the African Continent is acknowledged on every hand, and need for organization requires amplification. In large districts the supply is meagre to a degree; the veterinary officer where travel is limited, where natives pay little attention to their herds, where food is variable and uncertain, and where his staff is fractional, frequently has an enormous range of responsibility. In Southern Africa the white man comes more to the foreground, and cattle, horses, sheep, &c., are considered more valuable and better cared for.

In the enormous new fields of cultivation—Kenya, Uganda, Tanganyika, Sudan, &c.—one veterinary officer is all that can be afforded to supervise a district often as large as England, and his "assistant" frequently is more qualified to carry on the work of the office than to assist in scientific problems. The vet. lives at headquarters to direct the stables of the Governor, or to see that the racing and polo establishment is kept up to a fair standard. No doubt this may be regarded as a waste of the "staff," but in these outlying and

ten isolated districts "sport" should not be neglected, for amusements are few, and the health and contentment of officials is to a large extent dependent on such means of relaxation.

At the present time vast herds are raised by the natives in different parts of Africa. These herds are never parted with and constitute the wealth of the community, and the social status of the owner corresponds to the number of cattle in his possession.

Pleurq-pneumonia occurs in epidemics which usually carry off countless numbers of the stock, and the means of combating the disease is often not procurable. Vaccine treatment is only possible where veterinary surgeons are stationed, and the number of these is so small that, in spite of their activities, but a very small proportion of cattle can ever be treated.

The area of our African dependencies is so vast that it would probably take every qualified "vet." in Britain to deal satisfactorily with the problem.

In small territories like Italian Eritrea the systematic vaccination of cattle is possible, and, we believe, is efficiently carried out.

At present the natives never part with their cattle, but in the course of time development will open up channels of export for live stock, and the number of cattle in their herds will be a real and monetary value to the natives, and not as at present simply a standard of wealth. The fact that thousands of cattle die yearly in Africa to-day does not affect the outside world one jot, but the time will come when veterinary science must be prepared to preserve this stock for the benefit of mankind.

The fact that natives in some parts are giving up breeding cattle as they are dying in such numbers from a preventable disease does not affect the European meat market, but who will say it will always be so? This is the day of the growth and interdependence of one unit of the Empire on another, and certainly from numbers, the cattle of our African dependencies could supply all and more than we require.

The question of leave for the veterinary surgeon becomes one of some difficulty when he has fulfilled his period of service. Who is to take his place? No one may be available, for it may be 1,000 miles or more. The writer, whilst in Hong-Kong in 1893, was asked to take over the work and carry on the vet.'s work when he went on leave. The duties the writer had to undertake were not confined to dividing on hygiene matters only, but surgical operations of a major degree arose. A valuable cow was at death's door owing to an extensive slough of practically the whole of her udder. Removal of this mass presented no real operative difficulty, but the stench which clung to him was so rife that it was impossible for the surgeon to go near his human patients for three or four days.

Another operation was removal of a cataract from the eye of a huge German hound of great value. The local proprietor of the racing stables undertook

the treatment, and requested the writer to perform it. This was done under an anæsthetic, and the writer, assisted by two very powerful men—the proprietor and his assistant—and the injured cornea was removed. Suddenly the huge mastiff recovered from the anæsthetic, and, springing to his feet, tumbled the three men on their backs and escaping from them, fled to his master's house and ensconced himself in his kennel. On the following day the wound in the eye healed and no untoward signs or symptoms developed. These and other operations, especially gynæcological, fell to the writer's lot during the twelve months the local vet. was on his leave.

Annotations.

Parotitis in Typhus (P. A. Herzen, *Arch. für klinische Chirurgie*, vol. cxv, July, 1923).—In the pandemic of typhus in Russia in 1918, 2 per cent. of the cases presented parotitis. Gangrene of the legs and skin was also very common.

Bacterial Injections in the Treatment of Pruritus Ani (P. C. Knowles and E. F. Corson, *Archives of Dermatology and Syphilology*, 1923).—The authors suggest injections of *Streptococcus fecalis* vaccine as the best cure for pruritus ani. Pathological conditions should be excluded before this method of treatment is resorted to. The doses should be large and continued for some time.

The Diagnosis of Conditions causing Backache (G. Straub, *Journal of the American Medical Association*, vol. lxxviii, No. 10).—The author comes to the following conclusion:—

(1) The essentials for an etiologic diagnosis in cases of backache are system and thoroughness in examination.

(2) The search for remote causes and for those of local character is of equal, if not greater, importance.

(3) Congenital anomalies of the lumbo-sacral region predisposes to injury, with subsequent backache.

(4) In every difficult case the establishment of a diagnosis depends on close co-operation of the various diagnostic branches of medicine.

Response of Persons Vaccinated with Triple Typhoid Vaccine (Walter V. Bren and Bertha M. Challis, *Journal of the American Medical Association*, vol. lxxxi, No. 9, September, 1923).—Organisms of the typhoid group grown at room temperature furnish a more sensitive antigen for agglutination tests than those grown at incubator temperature. The room-grown organisms yield an

antigen that has about the same degree of agglutinability as the Dreyer standard antigen.

General clinical reactions to the triple typhoid vaccine are less numerous and less severe after the third injection than after the first and second.

The triple typhoid vaccine produces a good agglutinin response in the majority of persons to each of the three organisms included.

The agglutinin response is not influenced to any significant degree by previous vaccination, by previous typhoid fever, or by the degree of the general clinical reactions, or by previous vaccination and typhoid fever.

Lytic bodies against *Bacillus typhosus* and *B. paratyphosus* A are frequently present in normal and immune human serums, and they may interfere seriously with the agglutination test made with active serums. They are not found in immune rabbit serums.

Trachoma in Algeria (M. Dodieau, *Archives de Médecine et Pharmacie Militaires*, April, 1923).—This disease is of very frequent occurrence both among Europeans and natives of Algeria. Adults and children are alike infected, the percentage in several towns has been 80 and 90 per cent., and many cases of blindness are due to this disease.

The commencement of trachoma is insidious, and is very often unperceived for some time. It is very contagious, and rapidly spread by personal contact and flies. The proximity of Algeria to France renders a possibility of further infection in the latter country, where several cases have already been observed.

The chief cause of this infection being personal uncleanness, the only sure means of prophylaxis is to instruct the poor and ignorant on hygiene, and distributing soap amongst them for the purpose of washing their clothes and themselves.

Undulant Fever at Lima (Peru). *Epidemiology, Clinical Forms, Diagnosis, Treatment* (Rebagliati, *An. Facul. de Med.*, vol. v).—Undulant fever in the region of Tumbes, Peru, does not correspond with any of the well-known types, and it is not rare.

The author is of the opinion that in most cases the fly is the transmitting agent. Only one case has been observed in forty, where the disease was due to goat's milk used in making cheese. The beginning of the disease is generally insidious, resembling typhoid fever, but is sometimes sudden and accompanied with a cold fit.

In one case there was violent intercostal neuralgia, which began a week before there was a rise in temperature and persisted throughout the course of the malady. In another case an intercurrent unilateral orchitis dominated, which was considered as a complication and not as an initial symptom. Perspiration is rare, while nausea and vomiting are

often very marked. Antiserums and autovaccines have proved efficacious in all cases treated.

Intestinal Spirochaetosis of Fetid Colitis Form (G. Delamare and Achitoux, *Bulletin Sanitaire de Constantinople*, August, 1923).—Two cases of intestinal spirochaetosis are described, one primitive and subacute, the other following amœbiasis of long standing.

In the first case the patient had suffered for two months from diarrhœa and was very thin. A number of spirochaetes were found in the stools, but no amœba, leucocytes or red corpuscles. Although refractory for sixty days to every medication, the diarrhœa disappeared forty-eight hours after an intravenous injection of 30 cg. of salvarsan, and after a second injection was completely cured.

In the second case diarrhœa continued for four months, commencing August, 1920, refractory to all treatments, after which period the stools were more frequent (seven to nine in twenty-four hours). Vermifuge caused the expulsion of fourteen ascarides and epigastric pains. Examination for bacilli and amœba was negative; ulcerations were found on the rectal mucus by means of the rectoscope, and the malady was diagnosed as ulcerative rectocolitis. In August, 1921, and the patient was treated accordingly. A year later very rare amœba were found in the stools, numerous spirochaetes and many red corpuscles. After treatment with emetine and salvarsan the condition of the patient was greatly ameliorated.

Abstract.

TREATMENT OF A CASE OF DIABETES MELLITUS WITH INSULIN.¹

By A. G. BIGGAM.

PRIVATE B., received as a transfer from abroad on March 14, 1923, diagnosed diabetes mellitus.

History of Present Illness.—Commenced about January 24, 1923, when patient suddenly began to feel out of sorts, mouth very dry, great thirst and constipation, frequency of micturition, and itching at the point of penis. Sugar was discovered in his urine, also ketone bodies were found to be present. He was put on a diet consisting of restricted carbohydrate and vegetables.

Condition on Admission to Hospital.—Extremely thin and emaciated. Weight 7 st. 3 lb. Complained of great weakness. No thirst or polyuria. Teeth good, bowels regular. No signs of organic disease of respiratory or cardiovascular system.

Nervous system: Retinæ normal, all deep reflexes difficult to elicit. Knee- and ankle-jerks absent even after reinforcement. There were crops of boils in

¹ Abstract from the *Journal of the Royal Army Medical Corps*, vol. xli, No. 4, October, 1923.

gth axilla, but these rapidly cleared up under treatment. No other septic focus could be discovered.

Urine on admission showed sugar present in small quantity, also acetone, diacetic acid present in fair amount.

Treatment.—Patient was put to bed and starved for two days, getting only beef tea, coffee and tea. He was then found to be free from sugar and started on a modified Allen's diet and worked up the scale with one fasting day a week, till a trace of sugar again appeared in his urine. This occurred when he was having a diet of 750 calories a day. He was ordered two fasting days a week, and worked up from the bottom again until it was found that he could only tolerate a diet consisting of:—

Carbohydrates	...	...	...	55 gr.
Protein	...	...	...	62 "
Fats	...	...	...	48 "
Total caloric value 900 calories.				

This diet contained no bread at all, and any addition of bread immediately caused sugar to appear in the urine. His sugar tolerance was investigated by the clean s method on various occasions.

Patient was first ordered insulin on June 13, 1923, initial doses given being 10 units at 11 a.m. daily. He was kept on the same diet as he had been able to take and remain sugar free, without any sulfin.

Control examinations of blood-sugar were carried out at various hours during the day, and it was found that the blood-sugar was kept at a level varying between 0.17 per cent. and 0.1 per cent.

Insulin was increased by adding another 10 units before supper, making his total quantity 20 units in the day. His blood-sugar was now found not to be above 0.13 per cent. nor fall below 0.06 per cent. any time during the day. He frequently showed as low a level as 0.06 per cent., but never felt any ill effects from this hypoglycæmia.

Insulin administration was discontinued after a few weeks' course, and it was found that the patient could now tolerate a diet consisting of:—

Carbohydrates	...	...	...	30 gr.
Protein	...	...	...	68 "
Fats	...	...	...	83 "
Total caloric value 1,100 calories.				

He still continues able to tolerate this diet, and his urine remains free from sugar, but occasionally shows a very faint trace of ketone bodies by Rothera's test, but not sufficient to cause any reaction to Gerart's test. His weight is now 9 st. 4 lb. General condition extremely good. Can take quite a fair amount of walking exercise without fatigue. Knee-jerk and ankle-jerks now present but not very brisk, time normal. His reaction to 50 gm. of glucose indicates a very marked recovery on the part of the pancreas because of rest afforded by insulin administration, the highest point reached being 0.22 per cent. sixty minutes after the glucose feed, and a fall down to 0.15 per cent. sixty minutes later. Thirty gm. of bread can now be taken without causing any rise in blood-sugar above normal.

The patient has now recovered so much that he should be able to live a moderately active life, restricting his diet to 1,100 calories and carrying out a fast day once a week to rest his pancreas. He is not, however, considered fit for retention in the Army.

Current Literature.

THE INDIAN MEDICAL GAZETTE.

Vol. LVIII, No. 10, October, 1923.

Carbon Tetrachloride in Pharmacology and Therapeutics (R. N. Chopra and J. B. McVail).—

Carbon tetrachloride is the most efficient anthelmintic known for hookworm. It is of little value in *Ascaris* infections and of no value against *Tenia*.

The toxic dose of 1 to 4 c.c. per kilo. body-weight in these experiments is far in excess of the therapeutic total dose of 5 c.c., i.e., 0.13 c.c. per kilo., which is given as an anthelmintic to a normal individual weighing 65 kilos.

Owing to its low solubility and volatility and consequently slow rate of diffusion, only small quantities are absorbed into the circulation. Large quantities can therefore be introduced into the alimentary canal without untoward effects.

When given in medicinal doses and with a purge to persons organically sound it is safe, provided that the drug is pure and that it is swallowed and does not enter the larynx. Carbon tetrachloride itself and its vapour are very irritating, and if brought into contact with the mucous membrane of the respiratory tract in any concentration may produce a reflex stoppage of respiration, and later a stoppage of the heart and death. Therefore it must not be forced on struggling children.

The great contra-indication is a liver with impaired function such as is caused by alcoholism, chronic or acute. The liver appears to retain a large proportion of the small quantity which is absorbed, and so protects the vital organs from injury. The presence of heavy round-worm infection may also be a contra-indication.

Large and toxic doses of this drug, whether single or divided, have a damaging effect on the liver parenchyma. With therapeutic doses the damage, if any, is temporary and unimportant.

The action of the drug on voluntary and involuntary muscle is depressant. In medicinal doses it is slightly laxative and it has no abortifacient tendencies.

Notes on Some Cases of Frambæsia (R. Knowles, I.M.S.).—The degree of efficacy in treating cases of frambæsia with sulfarsenol and silver salvarsan and in curing the disease is about equal, one to three injections being necessary to cure the lesions and to render them spirochæta free.

Sulfarsenol has the advantage of being cheaper, and, as it can be given subcutaneously, it is easier to administer.

Intramuseular injections of sulfarsenol were tried in two cases, but were found to be very painful, and were therefore abandoned.

Sulfarsenol is equally efficacious, whether given by the intravenous or by the subcutaneous route.

Intravenous injections of silver sulfarsenol do not produce any bigger fall of systolic blood-pressure than do intravenous injections of sulfarsenol. There is no fall of blood-pressure after subcutaneous injections of sulfarsenol.

Hookworm Infection in the Coal Mines of Bengal (J. W. Tomb).—Hookworm infection is found amongst the majority (70 per cent.) of the workers in the coal mines of Bengal, but without causing any apparent hookworm disease. It may therefore be regarded as of little or no economic importance.

The infection is met with amongst 72 per cent. of underground workers and 53 per cent. of surface workers. It is twice as heavy amongst the former as the latter, the average number of worms per individual found amongst the former being twenty-eight, amongst the latter fourteen.

The hæmoglobin index amongst the infected is 12 per cent. to 15 per cent. lower than amongst the uninfected, the average hæmoglobin index of the uninfected being 80 per cent.

83·2 per cent. of mines are infested with hookworm larvae.

No practical remedy for the elimination of hookworm infection amongst the workers in the coal mines of Bengal can be suggested, having regard to the habits and customs of the primitive races from amongst whom mining labour is chiefly drawn.

Hookworm infection in general in the Asansol Mining Settlement is a light one. It is heaviest and most frequently in colliery surface labourers, still less in agriculturists, and least of all in the urban population.

The predominant species of hookworm in the Asansol Mining Settlement is *Necator americanus*, which constitutes 70 per cent. of the total number of worms examined. The infection in all cases was a mixed one.

New Treatment for Naga Sore (R. B. Abraham).—A female coolie, aged 45 years, had three ulcers on her leg, all larger than a rupee. She was on ordinary treatment for three weeks, but the ulcers showed no signs of clearing up. On September 16, 1922, she received 0·5 c.c. of 2 per cent. antimony tartrate intravenously. On September 20, 23, and 27 she had increased doses of injections. On October 2, 1922, she was discharged cured.

Unusual Complication in an Acute Case of Kala-azar (Mouindra Nath De).—A heavy leishmania infection may exist without much enlargement of the liver and spleen.

Noma of the cervix, although one of the rarest complications, may occur as well as noma of the face, genitalia and other parts. When it occurs in an elderly woman it is very apt to be regarded as a malignant disease.

Medical News.

The death of Dr. Hermann M. Biggs, of the Public Health Department, New York City, lamented with a sincerity which testifies to the importance of the man and his work. An ear worker in the area of preventive medicine, he has left a name and a fame which will continue as a lasting monument to good work conceived, developed and accomplished.

Many testimonies to his "Life of Service" are published in *Health News Monthly Bulletin* for July, 1923, of Albany, U.S.A.

SCHOOL OF TROPICAL MEDICINE.

FEVERS INVESTIGATED IN MANY LANDS.

SIR ION HAMILTON BENN presided at the dinner of the London School of Tropical Medicine (University of London) held recently at the Hotel Victoria.

The Chairman said that the School was now in its twenty-fourth year, and it had been an immense success. From its inception the number of students had gradually increased. Its operations were not confined to teaching the elements of tropical medicine to men who were going to the outposts of the Empire or to research in the laboratories of the School. It sent expeditions to all parts of the world, to investigate diseases on the spot. Twenty such expeditions had already been sent out. Dr. Newham, Director of Tropical Medicine, had recently returned from an expedition to British Honduras, where he had investigated unknown fevers and other conditions there and Dr. Thompson, Director of Protozoology, had just returned from his second expedition to Rhodesia, where much light had been thrown on blackwater fever and other conditions. One of the most important research expeditions ever sent out by the School had just left London, under the direction of Dr. Patrick Buxton, who had as his colleague Mr. Hopkins. This expedition had been rendered possible by the co-operation of Sir James Allen, who had obtained facilities in Samoa and elsewhere in the Western Pacific, which would tend materially to the success they all hoped for. They owed a very great deal to Mr. Austen Chamberlain and Lord Milner for their great influence in providing so much of the money necessary for these expeditions.

Other speeches followed.

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Original Communications.

AN UNUSUAL CASE OF VITILIGO IN A NATIVE OF THE SUDAN.

By R. G. ARCHIBALD, D.S.O., M.D.

Director, Wellcome Tropical Research Laboratories, Khartoum.

THE case which forms the subject of this paper was a native of the Northern Sudan, aged approximately 35 years, who for some time was employed as a servant on one of the steamers plying on the southern reaches of the Nile. According to his statement, he first noticed his skin changing colour three years ago, and since then the loss of pigment had become more complete as well as more extensive, causing considerable disfigurement, and incidentally subjecting him to a certain amount of ostracism on the part of relatives and friends.

FAMILY HISTORY.

This contained no facts of importance; his parents were apparently healthy, and none of his relatives, either near or remote, had ever suffered from a similar skin affection. He had been married fifteen years and had four healthy children.

Previous Illness.—Apart from an attack of small-pox when he was aged 3, he had never suffered from any illness; in fact, had always enjoyed robust health. He denied ever having had syphilis, nor was there any evidence either in his clinical or family history to doubt this statement.

CLINICAL HISTORY.

As already mentioned, the first indication of the disease appeared three years ago, taking the form of a small white patch on the lower lip; this was followed, a few months later, by the appearance on the extensor surface of the skin of the right foot of a similar white patch, which rapidly increased in size, extending in an upward direction as far as the knee-joint. The skin of the extensor surface of the left leg became similarly affected. Depigmentation then occurred on the skin of both palms, extending along the flexor and extensor aspects of both hands and forearms as far as the elbow-joint. The skin in the regions of both axillæ and the extensor aspect of the thighs then became affected. Patches of depigmentation then followed on the skin of the dorsum, penis, pubis and abdomen; the skin of the face, neck, scalp and ears also became involved, presenting an appearance as shown in fig. 1.

Associated with this depigmentation of the skin, there was also patchy depigmentation of the hair of the scalp, axillæ and pubis.

The irides remained unaffected. A certain degree of amaurosis was also noted in the axillæ and over the upper lip.

Figs. 1 and 2 represent generally the areas of depigmentation; these were most marked on the flexor and extensor aspects of the hands, the extensor aspect of the right thigh, and the right axillary region. In these areas the skin was ivory white in colour, presenting a marked contrast to

the areas where the normal chocolate brown colour of the skin still prevailed.

The margin of the depigmented areas was usually convex, being demarcated by a skin margin showing hyperpigmentation; the surface was smooth, and in no way showed impairment of sensation. On the dorsum of the neck the depigmentation had been followed by considerable erythema resulting from exposure to the sun. The patient suffered little or no physical inconvenience; he admitted, however, that he had felt the heat more readily, and consequently was the more easily fatigued when his work exposed him to the effects of the sun.

On examination he appeared to be well nourished and in good health. No lesions were present in the nasal and buccal cavities. The gums showed evidence of a slight pyorrhœa. The heart, lungs and abdominal viscera presented no abnormalities. The pulse averaged seventy beats per minute and was of low tension; the sphygmomanometer registering a systolic pressure of 95-100 mm. The nervous system, both motor and sensory, was unaffected. There was no enlargement of the lymphatic glands, and the thyroid gland appeared to be normal in size and consistency.

Examination of the peripheral blood showed no malarial or other parasites, and no evidence of blood destruction. A differential leucocyte count gave the following percentages: Polymorphonuclears, 62 per cent.; large mononuclears, 11.5 per cent.; small and large lymphocytes, 26 per cent.; eosinophiles, 0.5 per cent., showing a diminution in the polymorphonuclear leucocytes and an increase in the large mononuclears. The hæmoglobin estimation registered 90 per cent. A blood culture was carried out, 10 c.c. being inoculated into broth, but no growth of organisms was obtained. A monkey also was inoculated intraperitoneally with 2 c.c. citrated blood without ill-effects. The urine showed no abnormalities, and the faeces obtained after the administration of a saline purge showed neither protozoa nor evidence of a parasitic infestation. Plate cultures of the urine and faeces proved negative as regards the presence of pathogenic organisms. Nasal swab smears were also examined for evidence of *Bacillus lepræ* with negative results.

Scrapings of the epidermis from the affected areas were treated with caustic potash and examined microscopically; neither mycelial filaments nor fungal spores were noted. Cultures on suitable media confirmed also this observation. The possibility of the skin affection being a syphilitic manifestation either congenital or acquired remained to be considered. Wassermann tests, however, carried out on two separate occasions ruled out such a probability.

HISTOPATHOLOGY.

Portions of the skin with cutis were excised from a depigmented area and placed in picric acid, alcohol fixative, embedded and sectioned. Exam-

ination of stained sections showed there was little or no alteration on the *stratum corneum* and *stratum lucidum*; marked changes, however, were noted in the *stratum granulosum* and the *rete mucosum*; the cellular element of the former had diminished considerably; indeed, in places it had entirely disappeared, being merely represented by a thin strand of hyaline tissue devoid of cells interposing between the *rete mucosum* and the *stratum lucidum* (figs. 3 and 4). Marked changes were also present in the *rete mucosum*, this layer being reduced to two or three irregular rows of cells which had also undergone marked hyaline degeneration and vacuolation, many of the nuclei staining somewhat indistinctly (fig. 4). The basal cell layer was also involved in the degenerated changes noted in the other layers; only a few of the cells containing fine granules of melanin pigment; in some of the areas both cells and pigment had disappeared. The comparative absence of pigment was a striking feature of the sections. In the normal skin of the negro the pigment is not only present in the basal layer of the rete, but extends throughout the rete; in the sections taken from the depigmented patches, it was practically confined to a few cells of the basal layer and to a few scattered pigmented cells in the upper layer of the corium.

Nothing of an abnormal nature could be detected in the corium; the blood-vessels showed no evidence of endarteritis or periarteritis. Sections stained by Gram's and Levaditi's methods failed to demonstrate the presence of organisms or treponemata.

DIAGNOSIS.

There can be little doubt that the case represented one of vitiligo, using the term vitiligo as distinct from leukoderma, the latter indicating a condition where there is a congenital loss of pigment.

The shape and characters of the depigmented areas with convex edges demarcated by concave margins of skin showing hyperpigmentation differentiated it from chloasma and tinea versicolor and morphea, and the absence of anæsthetic areas and constitutional symptoms readily differentiated it from leprosy.

Subsequent Course of the Case.—The patient was kept under observation for four months, during which arsenic in the form of liquor arsenicalis was administered by the mouth and an ointment consisting of salicylic acid and lanoline daily applied to the affected areas. For the first two months the depigmentation steadily continued to extend, and then its progress appeared to be arrested.

At the end of the fourth month the patient presented himself for examination, stating that his skin was regaining its normal colour more especially on parts exposed to the effects of light, a statement which was corroborated even by a cursory examination. On the dorsum of the hands, which previously were ivory white in colour, small but distinct circular patches of black pigment were

appearing around the hair follicles, while larger irregular blotches of pigment were also present on the skin of the neck.

When observed a fortnight later the process of pigmentation had advanced considerably, the circular patches around the hair follicles on the dorsum of the hands had increased in size to 2-4 mm. in diameter, and in a few places had coalesced, while adjacent areas which a fortnight previously were totally devoid of pigment now showed small circular pigmented areas around the hair follicles (fig. 5); the pigmentation on the skin of the neck had also extended considerably, and it was apparent that the skin of this area would soon regain the whole of its pigment (fig. 6). The skin covering the face and ears was also taking part in this pigment regeneration, as also the skin over the abdomen, but in this situation the process, although definite enough, was not so prominent.

REMARKS.

The case which forms the subject of this paper appears worthy of record, inasmuch as it presents some rather unusual and interesting features.

In the comparatively short period of three years an extensive and, in areas, complete depigmentation of the skin of the patient had occurred, including also depigmentation of portions of the hair of the scalp, axilla and pubis. This depigmentation was unassociated with any constitutional disturbance, and laboratory investigations failed to elucidate the exciting cause. It was associated with histopathological changes, which consisted in the main of atrophic changes of the cells of the *stratum granulosum* and *rete mucosum*, together with a diminution or entire loss of pigment in the usual pigment-bearing areas of the skin.

From the references at one's disposal it would appear that histopathological changes of the affected skin are infrequent in vitiligo. Stelwagon [1] and others comment only on the absence of pigment in this disease. In case under consideration, the histopathological changes showed a marked departure from the normal negroid skin (figs. 3 and 4).

Any views regarding the possible ætiology in this case can only be hypothetical. Several observers, including Marie, consider that syphilis has an ætiologic relationship to vitiligo. Stelwagon, on the other hand, states there is no foundation for such an hypothesis. The results of the laboratory investigations in this instance certainly supported Stelwagon's view.

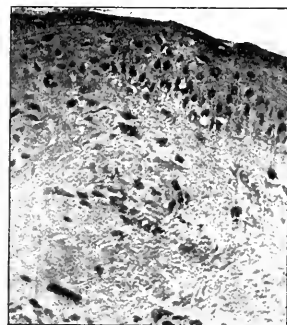
Of the various hypotheses regarding the ætiology of vitiligo there appear to be some grounds for attributing it to a disturbance of one or more of the endocrine secretions. The low blood-pressure in this particular case pointed to a suprarenal insufficiency, and in this connection it is of interest to note that McCall Anderson considers there is a relationship between suprarenal disease and vitiligo. Arsenic was the only internal therapeutic remedy administered in the case, but the writer has no grounds for considering it benefited the patient, or



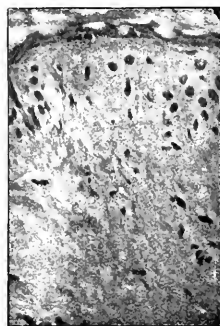
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is directly responsible for the unexpected return of the pigment to areas which for long periods had remained completely white. This generation of new pigment in areas which histopathologically showed such marked cell atrophy and degeneration is interesting, and would scarcely support some of the existing theories regarding the production of pigment in the skin.

CONCLUSIONS.

The main points in this paper may be briefly summarized:—

- 1) An account is given of an unusual case of vitiligo in which extensive depigmentation of the skin had occurred within a period of three years.
- 2) Laboratory investigations, including animal experimentation, failed to trace the ætiological factor.
- 3) Definite histopathological changes were present in the depigmented skin.
- 4) At the time of writing pigmentation was slowly returning to areas of the skin exposed to the effects of light.

REFERENCE.

STELWAGON and GASKILL, 1921. "A Treatise on Diseases of the Skin."

ILLUSTRATIONS.

- Fig. 1.—Showing the general distribution of the depigmented skin on the face and abdomen.
- Fig. 2.—Posterior view.
- Fig. 3.—Section of depigmented skin showing atrophy of the epidermis. $\times 300$.
- Fig. 4.—Section of depigmented skin showing atrophy of the epidermis and disappearance of the granular layer.
- Figs. 5 and 6.—Showing pigment reappearing on the dorsal aspect of the hands and neck.

hartoum,

September 12, 1923.

BIFID-TAILED CERCARIAE IN BURNUPIA.

By F. G. CAWSTON, M.D. Cantab.

While visiting various localities for the possible presence of fresh-water snails infected with cercariae responsible for parasitic disease in man and other animals, I have frequently found complexes of *Ancyliidae* attached to reeds and stones; but I have never detected any sign of infestation in the family.

The shells, which vary in size from $2\frac{1}{2}$ to $7\frac{1}{2}$ mm., adhere closely to floating wood and the reeds which grow along the banks of rivers; occasionally they are found on the stones in shallow water. In view of the close adherence of the shell, the animal is able to resist drying for longer than other intermediate hosts, and is not carried down-stream by the force of the river in the same way that those species are which do not adhere closely to the reeds. *Ancyliidae* are never found floating on the surface of the water, where they might be devoured by fish, and are able to resist other prophylactic measures which are suitable in dealing with fresh-

water snails which are susceptible to sudden changes of environment.

In many respects the shape of their shell acts as a protection to the enclosed animal similar to that of an operculated shell. The shells are easily broken, and their small size renders dissection for microscopic study rather difficult.

The presence of *Limnaea natalensis* and *Isidora tropicalis* heavily infested with cercariae in some pools at Schuttes' Draai on the Basutoland border in July, 1923, suggested that *Ancyliidae*, which were represented by some fine examples of *Burnupia* in these pools, might also prove to be infested with cercariae, and I drew the attention of the Minister of Public Health to the desirability of following up the research, in view of the fact that cercariae had not previously been reported from this locality. By the kindness of a friend I was able to visit the locality in October, 1923, and carefully searched this small tributary of the Caledon River. Microscopic examination of *Burnupia* obtained from floating reeds revealed the presence of numerous bifid-tailed cercariae, the head and tail being about 0.175 mm. in length, and the prongs about a third the length of the tail. No eye-spots were seen. The material has been preserved and posted to Dr. E. C. Faust for his identification.

Inquiries as to the presence of bilharzia disease in the Free State proved negative, although the occasional carriers of *Schistosomum hematobium* were found by myself at this Basutoland border both in July and October, 1923, and Dr. Brock, who has practised for many years at Colocan in the Free State, drew attention to the large number of cases of albuminuria there. Nor have adult schistosomes yet been recorded from other than experimental animals in South Africa; although the existence of several schistosomes other than the bilharzia parasites of man which have been present in the fresh-water snails I have collected from various parts of the Union suggests that cattle and other animals are occasionally attacked in this way.

The presence of cercariae resembling the bilharzia in this family of fresh-water snail, *Ancyliidae*, opens up a line of research of great interest and importance; for the various genera of the family are widely distributed and resistant to many prophylactic measures suitable in dealing with other intermediary hosts. Amongst those that I have collected are three distinct genera, including eleven distinct species.

Burnupia has the largest shell of the three genera, and I have collected one or other of the species in fairly large numbers at Grahamstown and Alice-dale, and from Baaken's River at Port Elizabeth, and in smaller numbers at East London, in the Cape Province, as well as at Maritzburg, Eshowe, Giggihlovu, Tongaat, Blackridge, Avoca, Umbo-gintwini, Malvern, Pinetown, Sarnia, Sea View, Umgeni and Umhloti in Natal.

In 1917 I collected another species from the Mooi river at Potchefstroom, and another from Pretoria district in 1918.

The absence of intermediary hosts from the dry vleis in one part of Basutoland that I searched in October suggested a means that farmers might adopt on fluke-infested farms by allowing one of two collections of water to be drained dry for at least a week in the year, thus destroying any intermediary hosts or eggs that tend to accumulate in semi-stagnant collections of water.

Bullous Impetigo Vulgaris of Adults (R. Bernhart, *Ann. de Dermat. et Syph.*, vol. iv, March, 1923).—Pure cultures of streptococci were obtained from an early bulla in the case of a woman, aged 20 years. A bullous eruption occurred on the back and extremities and lasted three weeks. The cultures were inoculated into the forearm with the result that a bulla appeared on the site of inoculation after forty-eight hours. The histologic picture was that of bullous impetigo.

A Study of the Growth of Certain Micro-organisms on Re-inoculated Media (R. Lloyd Felton, *Bulletin of Johns Hopkins Hospital*, September, 1923).—Experiments carried out by the author give the following results:

(a) Ordinary meat extract broth was exhausted of its food supply by repeated inoculation and growth of four different bacterial species, *Bacillus coli*, *B. lactis aerogenes*, *B. alkaligenes*, and *B. pyocyaneus*. Sterilization between inoculations was accomplished either by centrifugalization or by autoclaving or by passing through a Berkefeld filter. Before sterilization, the medium was retitrated to a pH 7.8.

(b) The number of times used media could be utilized for food by the bacteria differed with the different species and also with the method of sterilization. Sterilization by heat seemed to render the food supply of metabolized media more available for bacterial consumption.

(c) It was found, regardless of the method of sterilization, that the exhausted media were revived by the addition of peptone or a carbohydrate which could be oxidized by the specific organism; but that complete restoration did not follow the addition of tyrosine, meat extract or sodium chloride.

(d) Under the conditions of the experiments, it is assumed that the carbohydrate content of the media employed is the first element used up by growing organisms, and accordingly is the constituent necessary to revive the growth-promoting character of media so exhausted.

(e) The carbohydrate required to revive the exhausted media is one which is normally oxidized by the micro-organism in question: *B. alkaligenes*, normally being unable to oxidize any of the five carbohydrates employed, showed no increase in growth on the addition of these sugars to exhausted media.

(f) It is assumed that the transition in the rate of multiplication in the growth curve from the logarithmic increase phase to the stationary phase is not caused by depletion of food supply.

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Tropical Medicine and Hygiene

DECEMBER 15, 1923.

THE PART OUR SMALLER FIELD MAMMALS
AND MORE COMMON BIRDS PLAY IN
THE SPREAD OF DISEASE.

How little we know of the myriad of inhabitants that crowd our fields, swarm on the soil, or beneath its surface, burrowing here, nestling there, mostly in enmity one with another, and each endowed with

means of continuing its species by organs of procreation and protection peculiar to its kind. In medicine the microscope, the laboratory and its incubators are predominant as means of research; culture is studied by artificial light, and seldom in daylight. The cattle, the sheep, the horses are not only occupants of our pastures, nor the duck the challenged tenant of our ponds; each and all of these have their clientèle, their parasites, their diseases; each plays its part of usefulness in the scheme of nature, be it in the production of food, the balance of power, of economy, and above all on the part played by the spread of disease between man and animals; each carrying it, now checking, or propagating and transmitting fresh ailments. It is to the microscope that we look for the most part, however, we fly, and neglect the "naked-eye anatomy" of our small mammals, which are our daily companions in our walks abroad. Insects have of late been advanced in their importance, and we occupy in the study of medicine a foremost place. The insect eaters, the Insectivora, are however but little studied as vermin destroyers, and the part they play as carriers of disease only occasionally is noticed upon. We require a new branch of study, a medical naturalist whose work is to assign not only each group of animals but to each species in each group the part it plays in the economy of Nature, and the spread of disease through its vermin, &c. We know the words mice and rats as if they were but one species of each, and forget even that the brown rat and the black rat are different species; that one (we are always offhand certain which) carries plague by its bites, that mice are credited with the same vile evil—or does the flea actually spread plague? The "emerods" peculiar to bubonic plague are accurately described in I Samuel, v and vi; or was it really mice that spread plague in these early times, or was it the rat flea that did so, and the word mice is a mistranslation for rat? The question is raised because in the modern outbreak of the epidemic in Hong Kong in 1894 the rat and not the mouse was found to be the carrier of the flea that transmitted plague, and the golden images which the Philistines sent as a "trespass offering" unto the Lord were they images of mice or of rats? This would seem a point of no interest to-day; but were they mice, which mouse?—for there are many species of mice and each species of mouse has its own flea: the shrew, the field mouse, the dormouse and several others. If not a mouse at all, but a rat, which rat? Was it the brown or the black rat that at the period mentioned was prevalent? A nice question in the natural history of the progress of the black and brown hordes, and which of these brought plague in their train.

Another vexed question is raised by the accounts of the prevalence of emerods (buboes) and the variety of plague which prevailed. In I Samuel, v, 12, there is an interesting statement: "And the men who died were not smitten by emerods" (buboes); it is to say, along with the true bubonic plague, from which, as in Hong Kong in 1894, everyone affected died, there was a *pestis minor*, or mild plague present of which no one died. This the writer described as

existing before, during and after the true plague. There are the *tropical buboes* we speak of to-day, and they are no new thing. In 1877 plague occurred on the Volga. An expedition from Britain headed by the late Dr. Payne, of Westminster Hospital, visited the Volga during the outbreak of 1878-79. The Commission reached the Astrakhan outbreak too late (in which the death-rate was practically 100 per cent.); but 150 miles higher up the river they came upon an outbreak of *pestis minor* or tropical buboes, in which many were involved but no one died. This and many subsequent epidemics show that the outbreak in which people suffering from buboes (emerods) recovered, as stated in I Samuel, v, 12, was an outbreak of *pestes minor* really and not real plague; and no rats were reported! How easily mistakes may be made as to whether rats or mice were the actual ancient Biblical cause, we see from everyday experience. Only fourteen days ago a party of four men were shooting in Hertfordshire, of which the writer was one, when one of the party shot an animal which was variously named a stoat, a ferret, or a weasel. The resemblance between them is apt to lead to a discrepancy amongst sportsmen but little acquainted with the minor mammals of our fields. That it was a ferret was decided by the fact that a broken leather cord round its neck showed for what purposes it had been tethered. The following quotation from Sir Rickman Godlee, Bart., late President of the College of Surgeons, England, serves to show some of the more common occupants of the gamekeeper's larder or gibbet.

"There is no great variety. Of quadrupeds, the stoat, the weasel and the rat. The mole has an executioner to himself and a gallows of special design, and the hedgehog is seldom seen. Of birds, to place them in order of frequency, there are the jay, the kestrel, the sparrow-hawk, the magpie, the little owl and sometimes a rook and a crow.

"The land rat has other vices besides those usually mentioned. The gamekeeper and the farmer hate it because it takes eggs and young birds. But it is an enemy of the whole human race. One of its worst faults is harbouring the rat-flea. For this flea is the 'host' of the germ of that rightly dreaded disease, the plague. In insanitary countries like India and Egypt it causes an enormous number of deaths. One form of the plague is contagious from man to man, but it is also conveyed by the rat-flea from rat to rat, rat to man, and man to man. The last epidemic of plague in this country was the 'Plague of London' in 1666; but now and then cases occur near the seaports where plague-infected human beings and rats may get to shore unobserved. Medical officers of health are always on the watch for cases of plague and deal with them and their 'contacts' promptly and efficiently, but the plague-infected rats may get away and are not infrequently found dying or dead in the Eastern Counties. That is one reason why we should all try to exterminate the rat. From ancient times and in different lands the plague has been associated with rats and mice. We may recall the golden mice mentioned in I Sam. vi, 4, and many an old picture

where rats are shown scampering over the poor wretches dying of the plague.

"Little can be said in defence of the stoat and the weasel. They are bloodthirsty hunters and seem to hunt and kill for the pleasure of it. Thus they will pick out a particular mouse or rabbit and run it down with dogged perseverance. If they would confine their attention to 'rats and mice and such small deer' they might be let off; and hereabouts we would not grudge them a few rabbits; but the keepers accuse them of taking any amount of young birds and eggs. They have a wide gape; and stoats, at all events, can easily carry pheasants' eggs unbroken to their cubs in the 'bury.' Considering how many are killed it is a wonder they are not exterminated, for they are not remarkably prolific. Although the skins of stoats provide a valuable fur, they are mostly wasted in England, probably because the animals are 'smelly.' In Scotland and the North the stoat turns a pure or slightly creamy white in winter, except the black tip of its tail. Then it is called an ermine and its pelt adorns the robes of potentates and kings.

"Now as to 'our brothers, the birds.' No bird-lover can pass a gamekeeper's larder without a sigh. It goes to his heart to see the rows of lovely jays and magpies with their drooping heads and shrivelled eyes—'quite chapfallen.' But the gamekeeper has a different point of view and it is admitted that both these birds take eggs and young game. Jays are killed in large numbers, but, as they are wary birds, many survive to enliven the woods with their harsh cries. We seldom see or hear a magpie now, and, if we do catch its merry chatter, it will probably be seen swinging next day upon the gibbet. It is a pity that this gay bird which figures so largely in folk-lore and fable, should be utterly banished from our woods. I would plead for magpies being left alone when the rearing of young birds is over, for at other times they are useful to the farmer and harmless to the gamekeeper.

"Of the two hawks the sparrow-hawk is far the more destructive, and as, so far, there seems no risk of its being exterminated by the ruthless persecution of gamekeepers, I will not plead in its defence. But the case of the kestrel is different. It should be considered from the point of view of the farmer as well as merely from that of the preserver of game. It is the farmer's friend, for it feeds almost exclusively on mice, moles and beetles. Some ornithologists indeed acquit it of interfering with game preserves at all; but, on the other hand, there are the keepers, who are close observers, and give us chapter and verse for particular acts of depredation. So what is to be said except that, from the general point of view, there is strong evidence that kestrels do much more good than harm.

"The same may be said of the whole race of owls, even that aggressive and rather undesirable alien the little owl. All owls, except the little owl, are now protected in Oxfordshire all the year round by order of the Secretary of State (1919). So we do not see them on the gibbet, except an occasional little owl whose inquisitive nature has led him to explore a

drain-pipe rat-trap, when, of course, he has to take his chance. Owls are invaluable to the farmer, the food being chiefly rats and mice, small birds, beetles a few frogs, and perhaps a fish or two. The bad reputation they have acquired with gamekeepers is simply not supported by facts.

"Lastly we come to the carrion crow and the rook. I am afraid the crow deserves the 'black cap,' but it is a wily customer and often eludes justice. The rook, too, has plenty of brains, but he is shot occasionally by the farmer and the gamekeeper though more as a warning to his tribe than in the hope of exterminating him. You might as well try to abolish original sin. But, even if it be granted that he may take an occasional egg or chick, or dig up freshly sown maize, or stick his beak into a potato turnip, it must be allowed that he more than pays for this by the good he does in the destruction of grubs and insects."

Sir Rickman Godlee, Bart., in his leisure moments has enriched our literature by his studies in many branches in natural history; we hope he will publish his observations for public information and there especially help to encourage the country practitioner at home and the local doctor in the tropics to take heed of the smaller field mammals and the birds, as well as the insectivora of his surroundings.

My attention has been drawn lately to a series of articles by Sir Rickman Godlee, Bart., on the uses and depredations of our British field mammals, and the future the possible part they play in the spread of diseases amongst man and animals at home and abroad.

J. CANTLIE.

Annotations.

Resin Dermatitis (L. G. Beinbauer, *Journal of the American Medical Association*, vol. lxxxi, July, 1923).

—The author describes a case of vesicular eruption occurring on the second finger of the left hand of a violinist. Investigations showed that this was due to the use of resin.

Value of the Toxin of Rhus Toxicodendron in the Treatment of Rhus Venerata in the Treatment and Desensitization of Patients with Dermatitis Venerata (A. Strickland, *Journal of the American Medical Association*, vol. lxxxi, 1923).—The author advocates the use of rhus antigen as the best means of combating ivy or oak poisoning. Out of 356 patients treated in this manner only 2 received no benefit and nine improved slightly, the rest received prompt relief and rapid disappearance of the disease.

Three Cases of Erythema from Bismuth (A. Galland, *Bull. Soc. Franc. de Dermat. et Syph.*, vol. xxx, 1923). The author describes three cases of erythema occurring after injections of bismuth had been given. One case, an infant, presented a scarlatiniform rash on the lower extremity corresponding to the buttock in

which the drug had been injected. The other two cases, women who had previously received neosphenamin without eruptions occurring, presented urticarial rashes of several days' duration after the intramuscular or intravenous injection of bismuth salts.

Sickle Cell Anæmia (John G. Huck, *Johns Hopkins Bulletin*, October, 1923).—The author reports fourteen cases of this disease, two of which he describes in full. The affection is a specific disease entity, described so far only in the Negro race. It is fairly common. The sickling of the red blood cells is due to something inherent within the cells, not to any substance in the serum. This is possibly a surface tension phenomenon, not occurring in the circulating blood to any marked degree. It is transmitted according to Mendelian law. Attempts to transmit the disease to animals have thus far been unsuccessful.

Studies of Diabetes Mellitus: The Use of the Pancreatic Extract Insulin in the Treatment of Diabetes Mellitus (M. S. McCann, Roger Hannon and Katherine Dodd, *Bulletin of Johns Hopkins Hospital*, July, 1923).—Of ten representative cases of severe diabetes treated with insulin, nine derived some benefit, which was measured objectively in terms of lowered blood-sugar values, decreased glycosuria, improved oxidation of glucose, and in control of ketosis, as well as the relief of symptoms. Wide variations were observed in responses of the different patients to unit doses of the drug. The extra calories of food which patients were enabled to utilize per unit of insulin varied from 12 to 70 calories. The amount of extra carbohydrate which was utilized per unit (all sources of glucose being considered) varied from 0.5 to 3.6 gm. In the presence of severe infection the action of the drug is apparently less effective. The importance of exact diet regulation is emphasized. Cautious methods of balancing the diet and dose gradually are illustrated. Attention is drawn to the dangers of hypoglycæmia from overdosing. Prevention and treatment of this condition have been discussed.

Insulin is a very powerful and very valuable therapeutic agent from which most patients suffering from diabetes will derive benefit. It has failed therapeutically in certain cases, and it is in no sense a cure of diabetes, so that it is highly important that other methods of influencing the disease favourably should not be neglected.

Control of Hookworm Disease. Studies on Factors Involved in Migration of Hookworm Larvæ in Soil (Florence K. Payne, *The American Journal of Hygiene*, vol. iii, No. 5, September, 1923).—A series of experiments was carried out to determine the relation of certain physical and biological factors to vertical migration of hookworm larvæ in soil. A brief account is given of the relation of soil particles to soil moisture and soil air. It is shown that larvæ in

the soil lie within the capillary film of moisture surrounding the soil particles. They are subject to pressure by the surface forces and to movements of moisture within the capillary zone. It was shown by experiments that migration does not begin until the larva has reached the infective stage.

Prolonged studies showed: (a) That activity was increased by increase of temperature up to 35° C. (b) That activity was increased by contact with other objects. (c) That activity was interrupted by periods in which the larvæ were refractory to available stimuli. (d) That young larvæ showed greater activity than old under all conditions.

It was shown that the relatively slow utilization of nutritive material, which occurred in larvæ which were erect on the surface of the soil, was probably due to a mechanism for the conservation of energy, such as has been suggested in the activity of smooth muscle in other animals.

Investigations on the Control of Hookworm Disease. The Relation of the Physiological Age of Hookworm Larvæ to their Ability to infect the Human Host (Florence K. Payne, *The American Journal of Hygiene*, vol. iii, No. 5, September 1923).—Experimental infections were produced in three human subjects with *Necator americanus* larvæ and in six dogs with *Ankylostoma caninum* larvæ, in order to test the ability of larvæ which had utilized nearly all of their nutritive material to infect the host as compared with the ability of young and well nourished larvæ. Larvæ were artificially aged by migrations under laboratory conditions. The experiments with *N. americanus* indicate that even the oldest larvæ obtainable retained some power to infect, but this power was not so great as that possessed by the young larvæ. The experiments with *A. caninum* confirmed the results of the experiments with *N. americanus*. Evidence was obtained that a prior infestation may have some influence in rendering the establishment of a new infestation more difficult.

Beriberi and Rice Neuritis (Mataro Nagayo, *Journal of the American Medical Association*. Vol. lxxxi, No. 17).—The author considers that beriberi may be distinctly distinguished from the rice disease, not only from an epidemiological point of view, but also in clinical and anatomic features. Rice disease is considered as an avitaminosis, because of the fact that in the animal suffering from rice disease, the amount of vitamin B contained in the tissue and organs is remarkably diminished as compared with the normal state. In beriberi, however, no decrease of vitamin is noticed. A condition may be found in human beings similar to rice disease, called in Japan chichiko dyspepsia.

Osteomyelitis Variolosa (W. L. Brown and C. P. Brown, *Journal of the American Medical Association*, vol. lxxxi, No. 17).—From the report of two cases

by the authors, it is evident there are two distinct forms of osteomyelitis complicating or as a sequel to smallpox. First, the ordinary pyogenic metastatic osteomyelitis that occurs in other infectious diseases, and second, a distinct form of necrosing non-suppurating osteomyelitis probably due to the specific virus of smallpox, which frequently involves the diaphyseal ends of the long bones, destroying the epiphyseal lines and causing late deformities. The specific form of variolar osteomyelitis most frequently occurs in children. It is not recognized during the acute clinical stage as osteomyelitis, and the deformities are often overlooked because their evolution is gradual and the patient has often left the care of the physician before deformity occurs.

Intravenous Use of Diphtheria Antitoxin (Howard Osgood, *Journal of the American Medical Association*, vol. lxxxi, No. 17).—Fifty-four patients with laryngeal and nasofacial diphtheria were given intravenous injections of antitoxin in addition to intramuscular injections. Stock concentrated antitoxin issued by the laboratory of the New York State Department of Health was used. Only cases classed as severe on admission were selected for intravenous administration. The antitoxin was given undiluted or diluted in sterile physiological sodium chloride solution.

The indications for an intravenous injection may be thus outlined: It should be given in (1) late cases (the patient being ill four days or more without antitoxin) whether moderate or severe in type. (2) Severe and malignant cases, whether discovered early or late in the disease. (3) Laryngeal cases secondary to faucial involvement. (4) "Bull neck" cases and those with hæmorrhage. (5) Cases that do not respond to an ample intramuscular dose.

Contra-indications are: (1) Cardiac discompensation or severe organic lesion of the heart. (2) Chronic nephritis. (3) Horse serum or protein sensitivity, unless the patient can be successfully desensitized.

The following precautions should be observed: Use only a clear amber or colourless serum with high titre (1,200 units per cubic centimetre or over). Inject very slowly at body temperature. Stop the injection if untoward symptoms appear. Keep the patient warm, quiet and under close observation afterwards. Determine protein sensitivity.

The Treatment of Typhoid Fever by Intravenous Vaccines (K. Douglas Fairley, *Medical Journal of Australia*, September 22, 1923).—The author has found intravenous administration of typhoid vaccine in appropriate doses to be of great value in the treatment of typhoid fever. It does not replace the routine treatment of this infection, but it is a very important addition to the therapeutic armamentarium. With care in dosage neither excessive febrile nor focal reactions need be feared. Large initial doses of the vaccine must be avoided. A febrile reaction exceeding 40.5°C. is inadvisable. Focal reactions so rarely follow

these injections that when they do occur, they are probably quite independent of vaccine treatment.

The best routine treatment in an ordinary uncomplicated case of typhoid fever in adults consists in the daily administration for three or four days of a polyvalent vaccine of *Bacillus typhosus* as soon as the diagnosis has been made. The initial dose should be about 120 million *B. typhosus* and this may be gradually increased to 200 million if necessary. In young children it is advisable to use a small initial dose (about 10 million). This may be increased later according to the reaction of the patient.

Perforation, severe hæmorrhage, severe myocardial degeneration and severe secondary infection are contra-indications to vaccine therapy. Mild hæmorrhage, pneumonia, mild myocardial degeneration, meningeal symptoms and severe toxæmia are indications for the use of smaller doses of vaccine than usual.

Unless used early in the disease, vaccine therapy has little influence on the incidence of complications in typhoid fever.

Abstract.

THE TREATMENT AND PREVENTION OF MALARIA.¹

By H. A. SPENCER, M.R.C.S., L.R.C.P.

A FEW words upon this matter will not be out of place here, though I have already touched upon it shortly in previous papers. In 1912 and 1913 I treated a few chronic cases of malaria with the old original "606" with complete success, each case being put beneath a mosquito net forthwith to insure the impossibility of reinfection. I did not then combine quinine treatment, but they became quite clear of the disease at once and for good.

Syphilitic spirochaetes are undoubtedly killed by organic arsenic, and so is the trypanosome of sleeping sickness. These are, I consider, facts which may be accepted without reservations, i.e., that animal parasites are killed by intravenous injections of organic arsenic. The parasite of malaria, being also of this nature may also be included in the above category. In view of the fact that cases of syphilis and of malaria have been cured by the intravenous injection of organic arsenic alone, the sometimes expressed opinion that arsenic appears to act as a general tonic only is no longer tenable. Another metal, mercury, when administered to those suffering from syphilis, kills off the spirochaete; others might be mentioned, but I feel sure that the practice of a large number of medical men has proved the fact again and again and it was the knowledge that organic arsenic was fatal to animal parasites that led to my trying "606" for malaria in 1912.

That the combination of quinine with arsenical preparations in the treatment of malaria, and of mercury with arsenic in syphilis, goes further and effects a cure more speedily cannot be denied, and

¹ Abstracted from the *South African Medical Record*, Feb. 24th.

leads most practitioners to follow this as the most effective treatment. The cases recorded where syphilis has been cured by "606" alone have all been in those treated in the early stage, before any suspicion of systemic infection occurred, adding weight to presumption that when the parasites have gone farther, into the spleen, bone marrow and circulation generally, it is wiser to combine another parasiticide than to inject arsenic too frequently.

As regards the antidote to malaria, quinine in the treatment of the chronic affection, where I give organic arsenic intramuscularly every four days to two or three times, I get excellent results with a 10 gr. dose of quinine taken every night only. In the subacute and acute affections I like best 10 gr. thrice daily, or if this dose is objected to, then 5 gr. after each meal and a fourth dose at bed-time.

One sometimes hears the question asked, "Is it possible do you think to absolutely cure malaria?" I have no hesitation whatever in answering this question in the affirmative, and I conceive that there are few medical practitioners, who have given the matter serious attention, who fail to cure the majority of their cases provided that they are effectively protected against reinfection; that is the real trouble in the treatment of the disease, to insure the impossibility of reinfection after clearance.

I treated a patient in this town thirteen years ago for an acute attack of malaria, the treatment lasted eight days only owing to business calling urgently for my patient; but on putting the question to him only a few days ago, he informed me that he had never had any sort of recurrence or any other illness since then. Many patients of mine—such as constables and warders, who look to a spell of malaria now and then to excuse them from duty for a few days—do get reinfections and refuse to take any precaution in spite of their wives and families suffering severely and constantly as well as themselves, and I presume that this will continue until adequate protection is made of this perfectly easily prevented disease amongst all civil servants. At present the prevailing opinion is that "the Government" must keep them well and fit for the work they call upon them to do, i.e., provide them with protection against prevailing affections.

I never give quinine subcutaneously unless it cannot be taken by mouth; it is too painful. If there is any pain or even discomfort whilst giving organic arsenic in the small doses intramuscularly be sure it is evidence of too strong a solution not sufficiently diluted. If sufficiently diluted and the needle withdrawn very smartly after injection I get no discomfort whatever and no smarting along the track of the needle afterwards; patients come back again and again for these injections, and none have ever objected to them. Rain water properly filtered and boiled should always be used and never water distilled in those abominable metal stills which are periodically soldered. I have long given up the larger doses of organic arsenic in the general treatment of malaria, as the smaller doses do equally as well, and do not interfere for five minutes with the daily

routine of a patient; but rarely I use galy where there is considerable enlargement of the spleen, because I find that it diminishes the size of this organ very rapidly, combined with the regular use of quinine.

I have attempted to show that malaria in South Africa varies in no detail from its types and variations in other countries; that it occurs both at high altitudes so long as there exists water wherein mosquitoes can breed, and at low altitudes; that it tends to be milder and more chronic at high altitudes, more severe and more general at low altitudes, where it exists after it has died down (for the season) over the former; that the fluctuations in intensity are due here as elsewhere to meteorological conditions, dry summers favouring general or epidemic malaria, whilst wet summers with regular and frequent rains, produce the disease in sporadic form: that the severer forms of malaria are produced by saturation of the individual with mixed types of the parasite and that the symptoms of chronic malaria are very generally unrecognized and the real cause of them disregarded.

And in this connection, saturation, let me give some facts which are astonishing. Several authorities have recorded as many as thirty parasites to every hundred corpuscles in cases of saturation, whilst Sir Ronald Ross describes a patient as saturated when there are twelve parasites in every hundred corpuscles; but in 1908 Rogers recorded a fatal case of malaria in which "more parasites than corpuscles" were seen.

This is more easily appreciated when it is remembered that each *Plasmodium malariae* produce in the individual from six to twelve pores or young parasites every three days, whilst the *P. vivax* and *falciparum* (the malignant parasites) each produce six to twenty spores from each parasite every two days. And whilst this is going on the patient is being reinfected many times each night.

South Africa must be accepted as a malarious country, and no part of it can be prosperous where the disease is prevalent; more than this I have tried to emphasize the fact that even chronic malaria produces grave mental defects, which are very materially delaying the progress of the country district. Let me quote what a recent authority says of the mental condition of malarious subjects (S. P. James in "Malaria at Home and Abroad," published last year): "Their intellectual capacity is dull, their mentality slow, their memory defective and their ability to concentrate on a subject lacking. The mind is confused and the character changed, melancholy and irritability being marked features. Impulsiveness and sudden fits of anger are of importance from a medical-legal point of view." He quotes an analysis of a number of cases by Dr. A. T. W. Forrester in which there were eight cases of dementia præcox, six of delusional insanity and one of excitement with violence. Is it necessary to further emphasize the fact that malaria is sapping the intelligence of the rural population?

What is the remedy? Not a periodical distribution of quinine at enormous cost to the country,

repeated and repeated and repeated year after year! We know that ignorance has stood in the way of at least something being done effectively, as a settler at the Delagersdrift Settlement frankly told me when advocating efficient protection against mosquitoes with wire gauze: "We don't hold with your view of the spread of malaria; we know that the disease has always been here. The only thing is to get used to it." That is the opinion of the malarial mind of the rural population in general; the only thing to do is to give them a sign that they may know, by establishing examples of perfect health the year round when protected against mosquitoes.

For there is no immunity recognized in this disease, either acquired or inherited; there is no "getting used to it" and finding any protection by so doing. The toxin does seem to produce a lesser reaction in those who have suffered from much malaria as time goes on, but the invasion by the parasite continues, and the mischief it causes continues unabated through life. Individuals are met here and there who for many years have been exposed to infection to the same degree as, or even to a greater degree than, those amongst whom they have lived, and who are constantly and regularly affected, and yet these individuals have never yet had a single symptom of the disease. They will tell you that they don't get malaria, and it is quite true I met a few such individuals after three and more years in East Africa, sleeping out exposed and incurring the same hardships as did the others, and who never were infected apparently; some had lived for long in malarious parts of South Africa, where they enjoyed the same immunity, whilst those about them suffered. I know a lady who has for ten years to my knowledge shared the same risks from infection as her husband, who has been affected many times, and she has never had a symptom of the disease, never been bitten by a mosquito to her knowledge, nor has ever heard one near her. Is it some condition of the cutaneous secretions in such persons which protects them against mosquitoes, and who they will under no circumstances bite? In view of the most repugnant secretions of a native giving him no sort of protection this is difficult to believe. But it may be that some quality of the skin or of the orifices of the cutaneous excretory glands, down which the anopheline inserts her proboscis, may account for this individual immunity. Though I have watched and inquired for any degree of acquired immunity produced by repeated attacks amongst many thousands of cases of malaria seen or treated, I have never yet, during twenty years, been able to detect it. Neither have I been able to appreciate any inherited immunity amongst the many cases seen; their children suffer as severely as the parents.

In connection with the breeding of anophelines my observation leads me to consider that the important fact is not where will they breed, but where will the eggs hatch out and survive? For I have seen anopheline eggs in thousands upon pans of water in my fowl-run, and were these pans left in the shade the eggs would hatch out and survive; when I remove the

pans out into the rays of the sun the day through the water becomes so hot that the eggs die and sink.

Examining water tanks outside the quarters of single warders at the gaol, I found anopheline eggs on and the water full of mosquito larvæ. The mature insects then found their way through an open window a few feet away and infected the occupants of that room. These tanks were in the shade a great part of the day, but I can imagine the water tanks exposed to the summer sun all day, as many are, becoming too hot for the larvæ to survive.

In the exposed pans and vleis of the Middleveld, where there is no shelter except very close to the edges, I can conceive larvæ and eggs of anophelines to be killed by the direct rays of the sun, and thus many millions of them perish.

This may account for the fact that anophelines are to be found close to the edge of streams, spruits, &c., where they survive in the shade of grass and rank vegetation. But my experience is that anophelines will lay their eggs and the larvæ survive in many places where they are not exposed to be found, and which other breeds of mosquito, i.e., *Stegomyia* and *Culex*, are said to prefer. I trust none of these places. Again, a shower of rain upon these pans and other shallow receptacles soon spills them out on to the ground, where they perish, and I have seen mosquito eggs left high and dry around the edges of pools which have evaporated and diminished in size. Anophelines do not in my experience display any discretion at all, or choice of where they lay their eggs—any water at all, so long as it is water, but where unsuitable they do not survive, and die in myriads.

It is not generally known that anophelines will bite (and infect) individuals in broad daylight: it is known that they are very active in the early morning, but as daylight becomes stronger they retire to dark corners. I advocated the protection of windows and doors of the Delagersdrift School, built at the bottom of a valley amongst and against irrigating furrows and canals, with wire gauze—as much for the protection of the children from conveyance from one to the other by flies or pus from unprotected sores, &c., as from mosquitoes, feeling sure that the school would be used at night sometimes; but the reply was that it would not be used at night, and for the rest economy was pleaded by the district engineer. It was merely making a convenience of the truth of the matter, for the school is used at nights and has always been so used at times, and only those who visit such schools know that there are few pupils who have not unprotected veld sores upon bare legs, hands or faces, and that all are so used to the pest of flies that little or no attention is given to them. It was at this school recently that the school principal killed an anopheline mosquito upon the hand of a child, engaged in reading at his side in broad daylight. During the epidemic of 1920, that school was full of anophelines, in every corner of the desks, behind the blackboard and diagrams hanging on the walls, and mosquitoes, perhaps anophelines, are constantly killed by the pupils upon their hands and legs during school hours.

To conclude with some suggestions whereby the

shocking state of unprotection against preventable disease, in districts known to be severely affected with disease annually, may be remedied at least to some extent, I strongly advocate the establishment of as many examples of malaria-free people, living behind screened windows and doors, as possible.

It is impossible to move the farmer away from his water furrow or other source of drinking-water supply, and in many places the drainage of mosquito-breeding waterways, collections of water, &c., would be an enormous and very expensive undertaking. But the protection of their houses with wire gauze might well be made a matter of contract with all those proposing to live upon labour settlements and the like within a specified time after taking over a house or building a new one. I understand that this is to be done upon the settlement in this district already referred to, and I trust that it will be imitated elsewhere. The residents of such houses will be able to work the year round, and my experience leads me to predict that as elsewhere (e.g., the Panama Canal zone), these highly malarious parts will soon be referred to as "health resorts." I can advocate only example to those for whom nobody but themselves are responsible, but I know that examples will be imitated.

Those I would specially plead for are the large class of civil servants and Government employees living in houses belonging to the department whom they serve, living in malarious towns, and rural areas. These would comprise police, warders, railway employees and servants, schools and the houses occupied by the principal and teachers, and sub-native commissioners in the districts.

Not only give these Government servants proper protection but disallow malaria as a disability in those so protected, as was done I believe at Waterval Onder years ago with perfect success.

If there was understood it would lead to all warders, police, &c., living in their own houses sleeping under mosquito nets at once and always fit for duty.

Schools, hostels, school boarding houses, police quarters, Government owned houses occupied by civil servants, gaolers' quarters, station masters' houses and those occupied by white labourers especially, should all be provided with wire screens to windows and doors; this would initiate a most marked freedom from illness and disability and would be practising the most real economy possible. I have known these wire screens in existence and still perfect for twelve years, and have had them in my own house for nearly nine years, never as yet requiring renewal.

Mosquito nets are unsatisfactory; people will not take the trouble to tuck them round the bed at night or leave them hanging over the foot and head of their beds, so that mosquitoes sheltering beneath the bed easily find their way into the net; and in the morning they will not tie them up, so that when evening comes no mosquito can find its way inside it; added to this they are easily torn and people will think it foolishness to say that a mosquito will find the hole in the net, for but few of them have ever

seen a mosquito hovering up and down over every inch of a wire protection upon a verandah looking for a possible hole through which to gain admission to shelter. Nets do not last very long where there are children, and people very easily get careless about them, but where such Government servants as police and warders live in lodgings in the town where they are posted, and do not know when an order to transfer to another town may come, it can only be expected of them to invest in a net.

If authorities could by means be forced to take malaria seriously they could soon refuse licences to hotels, boarding houses, &c., until they were protected by wire gauze, and force landlords, by condemning their houses as unfit for human habitation, to protect houses over and against town sluits against mosquito invasion. There are houses in this town in which for nearly twenty years I have attended the inmates for malaria every summer.

It is proposed, as soon as possible, to establish hostels in connection with many large district schools and a very excellent idea it is, but I hope that they will one and all be properly protected against mosquito invasion, and not protect some whilst others are not protected because they are thought not to be in malarious places.

With a thorough knowledge of this district for the past twenty years, I am unacquainted with any spot throughout it where malaria has not occurred. For twenty years I have been preaching the established facts of malaria prevention. Every year I have, in annual reports, advocated the proper protection of the Government servants in my district and of those on Labour Settlements ever since their first establishment, but so far no effort has anywhere been made to carry out the preventive measures of an accepted preventable disease. Not a single example has yet been established in this part of the country. Is it any wonder that district surgeons are dissatisfied and have for years felt that so much of their time and energies have been wasted? The seed they have sown with so much confidence and assurance has fallen upon barren ground. I once received this encouragement: "Hammer away while you live; some is bound to stick." Is it true I wonder?

Current Literature.

INDIAN MEDICAL GAZETTE, vol. lviii, No. 11,
November, 1923.

Pandemic of Influenza in India in the Year 1918 (E. S. Phipson).—The amelioration of the appalling housing conditions which characterize the slums of Bombay and the raising of the general standard of living are sanitary and sociological considerations of the highest importance, but these are larger than can be considered in the present instance and it is the author's opinion that the next visitation of influenza may be expected before any great progress can be made in these directions.

Features of the 1918 epidemic are given and the lines on which action ought to be taken in the immediate future are indicated. The Bombay of a century hence presents such vistas of possibility, political and sociological, that the mind can scarcely envisage them.

The path of the sanitary reformer in India is beset on every hand with difficulties and discouragement, and yet, if his work is to be really effective, it must depend ultimately on the pressure of public opinion. It has been said that there is a soul of good in things evil, and if the experience of 1918 have brought some to those voluntary workers, especially educated Indians, of all classes who rendered such splendid service at a time of unprecedented stress, the distressing conditions under which the poor of Bombay continue to exist, it may be that Bombay may have in store for her a brighter history in future than she has known in the past. In whatever hands her future destiny lies it is hoped that the lessons of 1918 so hardly learnt, will not be easily forgotten.

Cultural Examination of the Urine in Kala Azar (L. E. Napier and B. M. Das Gupta).—Sixteen specimens of urine were taken from sixteen different untreated male kala-azar patients in whom the diagnosis had been made by the demonstration of the presence of the parasite. *In no case was a culture of herpetomonad forms of L. donovani obtained from the urine.* As the authors were interested in the success of Shortt (1923) in obtaining a pure culture of the herpetomonad form of *L. donovani* from the urine of a kala-azar patient they were disappointed in their own results carried out in connection with the possibility of urine being the transmitting medium of the infection of kala-azar. It is possible, however, that the discrepancy between their findings and those of Shortt can probably be accounted for by the fact that Shortt centrifuged the urine and thus obtained a deposit rich in cellular elements, whereas the authors were unable to do this, finding it impossible in the interests of sterility while working in the plains during the hot weather.

Case of Diabetic Coma treated with Insulin (A. H. Proctor).—In June, 1921, the patient, a female aged 33 years, developed typical symptoms of diabetes. The glycosuria was more or less intermittent and was controlled by dieting. In February, 1922, she left Calcutta for England, where she underwent continual treatment, without success. It was found impossible to get her urine sugar-free and she was not expected to recover. She returned to India with her husband in February, 1923, and remained fairly well till June, when she was seized with violent abdominal pains, rigors and diarrhoea. She was confined to bed, very weak and debilitated, until August when she developed an attack of dengue and was removed to hospital. On admission the patient was thin, emaciated and presented all the signs and symptoms of diabetic coma. Temperature 98, respiration 44, pulse thready and 156. She was deeply comatose and could not be roused. The extremities were cold, but there was little or no cyanosis. The

breath had the characteristic odour and the urine contained sugar, acetone and diacetic acid in considerable quantities. It was not possible to get the blood-sugar estimated, so it was decided to administer insulin empirically and watch the result. During the following twelve hours 60 units of insulin were given with the result that the apparently moribund patient changed into a cheerful invalid who did not look very seriously ill.

Intravenous Iodine in the Treatment of Septic Wounds (Phani Bhusan Mukherjee).—The author describes two cases of septic wounds which were treated with intravenous injections of iodine with successful results. The first case was that of a child of ten, who was bitten in the face by a rabid dog, and the second was an adult Mahomedan who was bitten by his horse in the thumb. In addition to local solutions, &c., $\frac{1}{2}$ c.c. of B.P. tinct. iodii was administered intravenously, undiluted, daily for the first four days, and then on every fourth day up to the second week, subsequently twice a week for the remaining six weeks, during which time the patients were kept under observation for the appearance of hydrophobia, the signs and symptoms of which, fortunately, never appeared.

Medical News.

STABILITY OF INSULIN.

The statements which have appeared in various medical journals and the public press to the effect that insulin, the new remedy for diabetes, does not retain its activity in the tropics has led to considerable misgiving. It has been learnt from the makers of "A.B." brand insulin, who are the largest English manufacturers, that owing to the long and elaborate process of purification through which their insulin is put in the course of its manufacture it has a very high factor of stability. They also mention that at the National Institute for Medical Research a batch of "A.B." brand insulin was heated to a temperature of 95° F. for one month, the activity of the insulin being accurately determined both before and after treatment. The result of this careful test showed that "A.B." brand insulin had retained its activity without any detectable loss. The manufacturers have also found that insulin kept through the six summer months in this country has not suffered any loss of activity that can be detected by physiological test.

Wanted Second-hand Copies of
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Colonial Medical Reports.—No. 144.—Trinidad and Tobago
(continued.)

The year 1920 was an unhealthy one. There were epidemic outbreaks of three infectious diseases. During the period January to March measles, whooping-cough and influenza—all fortunately of a mild nature—appeared in the district. Towards the end of the year a virulent type of influenza complicated by pneumonia swept over the district, the earlier cases appearing at Chatham and among the members of a family periodically resident at Erin, where the disease, I was informed, existed at the time. The poorly nourished, debilitated East Indian labourer suffering from chronic bronchitis and emphysema offered least resistance.

Measles and whooping cough were brought into the district from Port-of-Spain; the former was limited in its spread to one estate, but the latter was generalized throughout all the villages.

Handbills and posters on the subject of influenza received from the medical inspector of health were freely distributed, and with the co-operation of the managers of the estates, clergymen and schoolmasters the public were particularly advised as to the preventive measures to be adopted. Systematic visits of inspection were paid to the schools, and children suffering from measles or whooping-cough were sent home. In the case of the Chatham Government School a widespread outbreak of whooping-cough among the children necessitated the temporary closing of the school.

Bacillary dysentery appeared in various parts of the district during the months of May to October. There was an outbreak at L'Enveuse Estate, fortunately of a mild nature, and responding readily to the orthodox treatment. The source of infection was traced to a polluted pond which served as a supply of drinking water to the labourers. There was also a similar outbreak in the village of Granville due to pollution chiefly by the washing of soiled linens in the main stream which supplies the district with drinking water. The co-operation of the local constabulary and the realization of the danger on the part of the inhabitants saved the stream from further pollution and led to an early check in the spread of the disease.

Systematic inquiries were made into the causes and sources of infection during the epidemic outbreak of the above-mentioned infectious diseases, and weekly or fortnightly visits of inspection were paid to yards and premises in company with the sanitary inspector with a view to maintaining under organized control the sanitary conditions and habits of the people of the various villages.

The milk produced during the year was of good standard and the cattle were free from disease. The conditions under which milk is sold and consumed are far from being satisfactory, but the requirements of the bye-laws relating to the sale of milk in rural districts are being quietly enforced as in other sanitary matters in accordance with the spirit of the Public Health Ordinance. The masses are gradually being educated as to the importance

of preserving the purity of the milk supply without rigid enforcement by prosecution and fine.

Food.—The regular inspections of market places, shops, bakeries and market stalls were made with twenty seizures of various articles of food, e.g., pork, salt beef, coconut oil, sardines, salmon, smoked herrings, all of which were condemned and destroyed as being distinctly unfit for human consumption. The procedure was a novel experience to the shopkeepers, but it certainly improved the quality of the food exposed for sale during the latter part of the year. One shopkeeper was prosecuted, convicted and fined. All cakes, bread, &c., exposed for sale are screened or protected in glass-covered receptacles.

Water Supply.—A detailed report on the sufficiency and quality of the water supply of the district, including the results of chemical examination of various supplies, was submitted during the year. In the inhabited areas of the district, as before mentioned, there is no natural supply, and the insanitary provisions adopted for meeting this inadequacy are responsible for a considerable increase in the morbidity of the district.

The few streams in the district are found at Granville and in other sparse and scantily populated areas. Advice and guidance by the sanitary inspector as to the dangers of the pollution of streams used for drinking purposes was effective.

Permanent concrete drains should be substituted in the place of the insanitary and inefficient temporary earth drains in the main streets of Bonasse village (including Ste. Marie) and of Fullerton. The shallow concrete drain in the lateral streets of Bonasse village have proved satisfactory. The earthen drains in the village and on the larger estates remove storm water only partially.

Sewerage and Sewage Removal.—Both the pail and cesspit privies are in use in the district, though a large number of the recently indentured East Indians are still unwilling to abandon their custom of defecating on the exposed soil.

The pail system is to be preferred to the cesspit privy—in this district at least. The villages have to a great extent sprung up on reclaimed porous lands where the sub-soil water is liable to constant great fluctuations. In the more sandy parts the sub-soil water is seldom less than 3 ft. beneath the surface. Under such conditions cesspit privies are invariably filled with water, and in spite of the efficiency of the sanitary staff and the willing co-operation of land holders an offensive decomposing mass of liquid faeces breeding mosquitoes in abundance and polluting the surrounding atmosphere is to be commonly met with even in the main village of the district. The sandy nature of the soil causes constant cracking of the side walls of those few concreted privies, whilst its invariably porous nature permits ready pollution of the sub-soil water in a district where by necessity private surface wells are so often the only source of a drinking water supply.

In Bonasse, the main village, the available build-

ing space is exceptionally limited, and prior to the days of the Public Health Ordinance huts were allowed to be erected indiscriminately without any regard to available yard space or to the necessity of providing a privy for the use of the inmates. To-day, with the enforcement of the Public Health Ordinance, a cesspit privy stands cheek by jowl with your neighbour's door or window, and without the constant supervision of the sanitary inspector the condition of these cesspits and the odour of the effluvia emanating from them would depend upon the amicable or hostile relations existing between neighbouring householders.

Cesspit privies are certainly not the most satisfactory means of sewage removal for this district.

House Refuse.—A scavenging cart continues its useful work of removing house refuse from private and public buildings. Simple improvised dustbins are employed by most householders. The refuse is thrown and spread after a certain amount of sorting on the Bonasse swamp which it serves to gradually fill and reclaim. Precaution is taken to avoid its being the breeding ground of flies or the creation of a nuisance.

Malarial fever still continues to be the most prevalent disease in the district. The malignant type exacts a heavy death toll among infants and children.

Both the acquired and congenital forms of syphilis are particularly common throughout the district, except in the isolated villages of Granville and Point Coco, where the inhabitants lead the simple life. Eighty cases were treated with novarsenobillon during the year, in many instances the patient himself coming forward voluntarily to be so treated.

During the year 1920 I have witnessed a remarkable transformation in the outlook of the labouring classes towards sanitary matters. The individual no longer regards himself as an entity having no interest in the public health of the community as a whole. The sanitary inspector is no longer an enemy infringing upon his private rights, and the bye-laws and regulations of the Public Health Ordinance are not unnecessary and unjust enactments unknown among his strong and long-lived forefathers. To-day in Cedros the assistance and advice of the sanitary inspector are sought before the butcher slays his bull, before the landlord rents his house, and before the good Samaritan befriends the sick poor vagrant. The modes of spread of the more common infectious diseases are to-day well known and appreciated by many adult labourers between the ages of 20 and 40, and the uncleanly neighbour living willingly and contentedly amidst insanitary surroundings is looked upon with contempt and disgust. This is indeed much to be thankful for considering the educational attainments of the masses in this district.

Whilst therefore public health works of an important nature still remain to be undertaken, especially in the direction of water supply and sewage removal, the great improvement in the

hygienic sense and public health spirit of the labouring classes amply repays the efforts of the local authority, Cedros, during the year 1920.

ROXBOROUGH DISTRICT, TORAGO.

One unfortunate feature in this district is the high mortality rate of infants under 1 year of age. It amounts to nearly 190 per 1,000 births. I think the chief factor in this connection is the wanton neglect to which infants are subjected by their parents and guardians. Another very important factor is the combination of ignorance and superstition which can only be effaced by education through the years.

Stillbirths are also very many, and will so continue till the district nurse becomes a reality.

Food, &c.—Meat is exposed for sale under the shed of a grocer in the hamlet of Roxborough. There are no hygienic measures undertaken to ensure freedom from pollution.

I suggest that a small market for the sale not only of meat but all marketable commodities be constructed. For now that a sanitary inspector has been appointed for the district, meat and food inspection is possible, and should be carried out under more favourable conditions than hitherto.

Enteric Fever.—There was a small outbreak of this disease during the first eight months of the year. There were thirty-five cases with four deaths.

It is difficult to trace the source of this outbreak, but after deliberation and the sifting of histories, I incline to the belief that the origin was due to contact with carriers landing at the various ports of call. The more northerly ones suffered first, then the spread passed in a southerly direction. Lastly, sporadic cases occurred indiscriminately at various places. On the whole the illness was mild and the usual sanitary precautions were observed throughout.

Vaccs.—For six months of the year 1920 a vigorous campaign was carried out against this hideous and ubiquitous pest. Statistics of novarsenobillon injections are as follows:—

Injections	Subjects		Total
	M.	F.	
Single	66	73	139
Double	21	18	78
Triple	20	4	72
Quadruple	1	0	4
Recurrences	1	2	0

My aim was rather to abolish infection by contact, i.e., to destroy active manifestations of the disease.

Hence my subjects were largely children in the first and second stages of the disease.

Now that a continuous supply of 914 seems practically assured, I am hoping for a disappearance of the disease in a few years.

PORT HEALTH OFFICER.

Ships Visited.—The total number of ships visited was 1,038, as against 1,331 in 1919. Eight vessels arriving from convention ports were visited owing to their having persons under surveillance among their passengers.

Owing to the revision during the year of the regulations governing the visiting of ships, vessels arriving from non-convention ports are exempt from visits, e.g., British, French and American (U.S.) ports, provided their bills of health are clean.

Fumigation and Disinfection.—543 vessels were fumigated and 120 disinfected, the corresponding number in 1919 being 709 and 177. The number of packages of passengers' luggage fumigated was 41, as against 3,207 in 1919. This great difference is fully explained by the fact that from August 1st Guayra has been exempted as a port against which fumigation of baggage is no longer carried out.

Passengers and Crews.—Inspection: Passengers and crews to the number of 30,451 were inspected.

In 1919 the number was 29,818. This increase has followed, in spite of visits to vessels from many non-convention ports having ceased since August.

Surveillance.—The total number of persons placed under surveillance was 1,093, of whom two were for small-pox, and 1,091 for yellow fever and bubonic plague. In 1919 there were 953 persons, twenty-three being for small-pox.

Twenty-six persons were allowed to proceed to country districts under the supervision of the several district medical officers.

Quarantine.—It is gratifying to record that, notwithstanding the large number of vessels calling at this port from most of the South American States, there has been no case of quarantinable disease in the harbour during the year, unlike 1919, in which there were two severe cases of small-pox from South America.

While the Clayton disinfecting barge had fallen into such a state of disrepair as to necessitate its being scrapped, the steam disinfecting apparatus at Lenagan has been thoroughly repaired and made quite fit for service.

Colonial Medical Reports.—No. 145.—Bahamas.

ANNUAL REPORT OF THE CHIEF MEDICAL OFFICER FOR THE BAHAMAS, A. H. B. PEARCE, TOGETHER WITH THE REPORTS ON THE BAHAMAS GENERAL HOSPITAL AND PRISON FOR THE YEAR 1920 AND THE FINANCIAL YEAR ENDING MARCH 31, 1921.

Nassau, New Providence,
Bahamas.

VACCINATIONS.

YEAR ending December 31, 1920: 1,309 successful, 93 unsuccessful.

The above shows the vaccination returns for the year ending December 31, 1920. I pointed out last year in my annual report that such abnormal success was impossible. Small-pox has been practically at our doors during the last year, and it is apparently only through good luck that so far we have escaped. I can only repeat my warning that we are running a grave risk with a half vaccinated population.

OUT-ISLAND MEDICAL SERVICE.

The same conditions prevail in the out-islands with regard to medical attendance as last year. Spanish Wells was attacked by a severe outbreak of typhoid which lasted during the greater part of the summer. Dr. Knight was sent by the Government to assist Dr. Johnson, the medical officer for Harbour Island, in combating this outbreak. I was very struck when I made my official visit of inspection to Spanish Wells with the great hardship people in the out-islands have to contend with from lack of medical attention.

Although Spanish Wells has been included recently in the district of the Harbour Island medical officer

yet, owing to weather conditions, it may be days before this officer can reach this island. If the people in an island like Spanish Wells complain, what must the inhabitants of the more distant islands suffer, when the only means of obtaining medical aid is by visiting Nassau in a small sailing boat. The Legislature last year passed a Bill creating the office of medical officer for Bimini. I drew attention previously to the urgent necessity of such an appointment, as Bimini is in daily communication with Florida, and with no qualified medical man stationed there to enforce quarantine regulations the Colony was liable to be invaded by whatever epidemic might be raging in Florida. Unfortunately the salary was fixed at £200 per annum and so far there has been no suitable applicant. I fear for such a meagre remuneration the services of a well qualified British medical man will never be obtained.

VENEREAL DISEASE.

No attempt has been made to combat the ravages of this widespread and devitalizing disease, in spite of the recommendations of the Venereal Commission which sat in 1918 and the passing by the Legislature last session of a most comprehensive and far reaching Bill. This Act is unworkable for two reasons: insufficient staff and lack of the necessary funds.

In my last report I pointed out to the Government the urgent necessity for the appointment of an expert bacteriologist, who has been accustomed to perform blood tests and venereal bacteriology, and whose services, apart from venereal disease, would be of immense benefit to the Colony. The Legislature brought in a Bill to provide for such an office, but unfortunately the terms of the appointment were such that the Secretary of State was compelled to disallow the Bill. The Commission for combating venereal disease, which visited the West Indies last year, was unfortunately unable to visit the Bahamas, owing to difficulty of transport and quarantine restrictions that were prevailing at the time. I regret exceedingly the inability of this Commission to visit us as I feel certain that the advice and recommendations of expert medical authorities on this distressing problem would have been the means of inaugurating an immediate campaign against what is, in my opinion, the most deadly and terrible disease the Colony has ever been called upon to face.

BAHAMAS GENERAL HOSPITAL.

A great many radical changes have taken place in this institution during the year. The sanitation, which has been the subject of adverse criticism from every medical officer who has inspected it, has at last been entirely changed and an up-to-date sewage system inaugurated, which has now been in use for some months and is giving every satisfaction. Already a great decrease in the number of flies is becoming apparent and the general cleanliness and comfort of the patients improved. I drew attention in my last year's annual report to the proposed erection of a new operating theatre and X-ray room, also the purchase of an X-ray plant. This new operating theatre and X-ray room are nearly completed and will be a tremendous boon to the Colony, as they will enable the inhabitants to be treated in Nassau, instead of having to visit the States for major surgical treatment as hitherto at great expense and inconvenience. Another decided improvement is the proposed erection of a paying patients' ward, for which the Legislature has voted the sum of £2,500, and I hope to be able to mention in my next annual report that this department is in full working order. I have felt ever since I became closely connected with this institution that the Colony was expending a large sum annually for the upkeep of a hospital which practically benefited only the lower grades of society, the majority of whom are suffering from venereal disease, and that deserving cases were compelled in many instances to leave the Colony as they were naturally not desirous of receiving treatment in what practically amounts to a lock hospital. With the erection of a new private patients' ward, a new up-to-date theatre, only to be used by clean cases, and the improved general sanitary conditions, I feel confident that a modern hospital will be available for the inhabitants of the Bahamas. I am also glad to be able to report that the Legislature has voted the sum of £2,000 for the establishment of a running water supply. It does not seem possible to imagine an institution of this size being without such a system. At present there

is no running water in any of the wards and in periods of drought great inconvenience is experienced and sometimes actual suffering from lack of water. The Legislature has also voted the sum of £2,500 for the erection of new quarters for the European matron and nursing sisters, the present being entirely unsuitable in every possible way. A complete new outfit of surgical instruments and surgical appliances has been purchased and also the furniture and fittings for the new theatre, so that I trust in my next annual report to be able to state that the Bahamas General Hospital is an institution that is a credit to the Colony. An X-ray apparatus, specially selected by Dr. Culmer while undergoing a post graduate course in X-ray work in New York, has been purchased from the General Electric Company. We are now awaiting the installation of the new lighting system for the town before the X-ray plant can be fitted up for use.

RESIDENT SURGEON'S REPORT ON POST-GRADUATE COURSE IN ROENTGENOLOGY.

In accordance with your instructions I proceeded to New York early in September last for the purpose of taking a post-graduate course in roentgenology.

Through the courtesy of Dr. Chace, the superintendent of the hospital, I was given a complimentary ticket admitting me to the lectures and clinics for one week, which I was glad to take advantage of and which served to prove to me the excellence of the teaching by lectures and the wealth of material in the various clinics.

The X-ray course ended in six weeks, far too short a time in which to acquire more than a very superficial knowledge of the subject: and with the acquiescence of the Government I repeated the course, twelve weeks in all. The courses were divided into therapy, which I did not attempt, and technique and interpretation, both of which I took. Although "technique" might be supposed to include the actual working of X-ray machines, only the theory of the mechanism was taught, and graduates were not permitted to install or manipulate machines: the usual procedure being that the manufacturer installs the machine, and where necessary gives instruction in its manipulation. Interpretation occupied the greater part of the time devoted to X-ray work, and is the most important, most interesting and, I may add, most difficult part of the work, a thorough knowledge of pathology and general medicine and surgery being necessary to ensure an intelligent reading of plates and films.

After inspecting X-ray machines of various manufacturers I finally decided to advise the purchase of one manufactured by the Victor X-ray Company, the controlling interest in which is vested in the General Electric Company, and known as the "Bedside Unit." This machine is capable of an output of 30 ma., and suitable for all ordinary X-ray work: and of a cost approximating the amount granted by the Legislature for the purpose.

The "Bedside Unit," with accessories, has been ordered since my return, but it is unlikely that it will be possible to make use of it until the new alternating electric current has been installed.

Colonial Medical Reports.—No. 143.—Bahamas (continued.)

THE MARKET.

Taken on the whole the general condition is satisfactory, several suggestions and recommendations I made last year have been carried out. The cleanliness, I am sorry to say, leaves much to be desired. The Chairman of the Board of Health appointed a special committee to ascertain the best means of improving this important defect.

SLAUGHTERHOUSE.

In spite of the fact that last year the Honourable House of Assembly voted the sum of £4,000 to erect a modern abattoir, this sum has been allowed to lapse, and the extremely unsatisfactory and insanitary state of affairs continues to exist.

QUARANTINE.

Quarantine against foreign ports was enforced continuously practically throughout the whole year. The following countries were in quarantine: Haiti for small-pox. Jamaica, Alastria and Vera Cruz for bubonic plague and yellow fever. Cuba was in quarantine for small-pox the earlier part of the year, but as the British Minister there reported that the epidemic had died out, quarantine was lifted. The Board of Health of New Providence inaugurated quarantine under the authority of the Health Act against Spanish Wells for typhoid fever.

EPIDEMIC.

As usual typhoid fever was the most serious disease that occurred in epidemic form in the Colony for the year. This disease broke out in epidemic form in Spanish Wells in February, and continued until September. Hope Town, Abaco, was attacked by a similar outbreak, which was at its height during the months of June and July. As long as sanitation remains in such a primitive state in these islands we must expect a recurrence of these epidemics every summer. The official reports of my visits to these two islands are as follows:—

REPORT ON SPANISH WELLS.

In accordance with instructions I proceeded by motor boat *Kestrel* to Spanish Wells and Harbour Island on the evening of October 20, conveying Nurse Penobia Dorsett. I arrived at Spanish Wells on the afternoon of October 21, and after leaving Nurse Dorsett, proceeded to Harbour Island to consult with Dr. A. T. W. Johnson. The next morning, taking Dr. Johnson with me, I returned to Spanish Wells and visited the patients suffering from typhoid fever. In the afternoon I called a meeting of the local Board of Health and made a thorough inspection of the sanitary prevailing conditions in Spanish Wells.

I saw in all twenty-three typhoid patients. Three of these cases were of recent origin and seriously ill, the remaining cases were either out of danger or convalescing. Dr. Johnson informed me that there had been several cases of intestinal hæmorrhage during

the epidemic, due to indiscretion in diet, in spite of the repeated warnings and instructions regarding dietary. Flies were present in large numbers in every sick room I visited, and there appears to have been little or no attempt to destroy these conveyances of infection, although Dr. Johnson informs me he has preached an anti-fly campaign for the last three years.

Dr. Johnson told me that a great improvement has been made in the cleanliness of the settlement since the appointment of Mr. Munro as sanitary inspector. I must say Spanish Wells compared favourably with Hope Town, which I recently visited during a similar epidemic, but one could easily see that the improved conditions were of a very recent date. There were five pig sties in the settlement. These pens were undecked and an undoubted source of fly fertilization.

The medical officer of the district has supplied the relations and friends of the patients with carbolic acid, and ordered the thorough disinfection of all stools and excreta of the patients, but I doubt whether these instructions have been carried out. This fact, together with the fly as a carrier, easily accounts for the spread of the present epidemic. When one considers that a large number of the convalescents from this epidemic will undoubtedly be carriers for some time to come, sporadic outbursts of typhoid among the remainder of the inhabitants, who have so far escaped, will be bound to occur. To combat a recurrence of the epidemic I would recommend the inoculation of the remainder of the inhabitants with typhoid vaccine, provided they will submit to this prophylactic treatment. During my inspection I was struck with the scarcity of latrines, and on my pointing out this state of affairs, one of the members of the Board of Health worked out the ratio between the number of families to latrines. He stated that there were 155 families in the settlement, 122 had latrines, leaving thirty-three families the bush or the courtesy of their friends.

It is often, owing to weather conditions, impossible for Dr. Johnson to visit Spanish Wells, and as I consider the services of a resident medical officer at Spanish Wells, who shall be under the control of Dr. Johnson, are urgently required until the present epidemic is stamped out, I therefore strongly urge the Government to send Dr. C. Knight at the first opportunity. In an interview I had with His Excellency the Administrator I pointed out the urgency of a physician being sent to Spanish Wells, and he instructed me to approach Dr. Knight on this matter. Dr. Knight informed me that he is prepared to go, and will remain there as long as Dr. Johnson requires his services.

I advised the Board of Health to have all typhoid excreta buried in trenches away from the settlement near the shore. But unless a medical man is on the spot to supervise this and see that all anti-typhoid precautions are properly carried out, I fear the present epidemic will linger on indefinitely.

I found a considerable amount of discontent with the present rigid quarantine restrictions, and I endeavoured to discuss the question of the exporta-

tion of their products and the possibility of their being allowed to go sponging, but they would not consider any of the suggestions made. As there have been no fresh cases for fourteen days, I think if in another twelve days there are no fresh cases, the possibility of raising the quarantine may be considered, provided the medical officer of the district is of the opinion that this can be safely done.

REPORT ON HOPE TOWN.

I proceeded to Hope Town on the schooner *Joffre*, and arrived there on the evening of July 2.

I went ashore and met the Commissioner, Mr. Johnson, and Mr. Kendrick, a licensed unqualified practitioner. I visited in all seven cases of sickness. Five of these cases were undoubtedly typhoid, the remaining two cases were gastro-enteritis and malaria. Mr. Kendrick informed me that he had treated, since the beginning of the epidemic nine weeks ago, twenty-one cases which he considered were typhoid. I saw several of these convalescent cases with him, and they all looked typically post-typhoid.

In the afternoon I inspected the sanitary condition of the settlement. Hope Town consists of one main street with several narrow lanes between the houses. In several cases the houses are so close together that it is impossible to walk between them. It appears to have been the custom in the past for a man who owned land to build on it, also his children and grandchildren. As a consequence you have several families huddled together on a small portion of land, with cesspits sunk indiscriminately, and without any regard to living quarters or kitchens. In several cases I saw instances of the kitchen and cesspit being in actual contact. Pig styes were another source of danger. Nearly every person seemed to keep pigs. The styes were, as a rule, far too close to the houses, and in several cases were attached to the main dwelling house. They were undecked and 2 or 3 ft. deep in slime and filth. The yards, as a whole, were in a shockingly dirty state. In fact the whole settlement requires to be thoroughly cleaned up. The services of an efficient and conscientious sanitary inspector are urgently needed. In all my experience, even in Egypt, I doubt if I have ever seen so many flies. They literally swarmed in thousands, and are undoubtedly the main cause of the spread of the epidemic. I am of the opinion that it will take at least £100 to clean up Hope Town thoroughly. Unless this is done I fear there may be a very widespread and severe epidemic.

When I saw the insanitary condition of Hope Town I asked Mr. Johnson to call a meeting of the Board of Health, which I attended. I explained to members the nature of the epidemic that was prevailing in their midst and the conditions that were responsible for its spreading. They appeared to be only too anxious to do everything I suggested, but asked for the services of an efficient sanitary inspector and funds to enable them to clean up their settlement.

There is near the shore some Crown land which is very much overgrown with bush and used as a public latrine. This land urgently requires to be cleaned.

Drinking water used is as a rule rain water, as all wells have been condemned.

The following were the recommendations I made to the Board of Health:—

(1) Anti-fly campaign, and protection of food from fly contamination.

(2) Boiling of all water before drinking.

(3) Disinfection of all cesspits with chloride of lime and crude carbolic.

(4) All stools from patients (and convalescents for at least three months) to be conveyed out to sea and dumped.

(5) Thorough disinfection of all utensils used by the sick.

(6) Cleaning up of all yards and removal of all pig styes outside the township; if not possible, to remove them as far as possible from the dwelling houses, and to see that they were kept properly cleansed and decked.

(7) All bush to be cut down, especially on the Crown land by the shore.

I left medicines and disinfectants with Mr. Kendrick, and advised him regarding treatment, and disinfection of patients' bed linen and excreta, &c.

A sporadic case of diphtheria occurred in Nassau in November. This case is of interest as it proves the miraculous efficacy of antidiphtheric serum and the usefulness of the aeroplane in conveying the serum, which was not in stock in Nassau, from Florida. I was asked to see the case early in the afternoon in consultation, and came to the conclusion that it was either a severe case of Vincent's angina or diphtheria. As I pointed out in my last annual report there is no laboratory in the Colony for making a bacteriological test of such a case, so decided it would be safer in the interests of the community to treat this case as one of diphtheria. I therefore removed the patient and all contacts to the quarantine station and closed up and disinfected the house. I cabled to Miami for serum, which arrived the next morning at 10 a.m. by aeroplane, and the patient had the first inoculation at 12 o'clock noon. In twelve hours the membrane had diminished considerably in extent, and after two more injections it had practically gone. All contacts were also inoculated.

Chicken-pox, pertussis and mumps were all more or less epidemic during the year. Pertussis seems to have been particularly virulent this year, several deaths occurring from broncho-pneumonia and diarrhoea as complications.

PUBLIC HEALTH AND SANITATION.

The general health of the colony was decidedly better than last year. Fortunately we escaped the influenza epidemic which was so prevalent in the States during the early part of the year, and which attacked the colony with somewhat disastrous results last year. Typhoid caused some mortality in the out-islands, but in New Providence, while it suffered from the usual summer epidemic, the mortality was not high. It is impossible to form any statistical evidence of the death-rate from any disease, as there is no death registration in the Colony. I am glad to be able

report, however, that in January, 1922, registration of deaths will be compulsory for Nassau, and will then be possible to form some estimate of the effects of any epidemic that may attack New Providence.

Typhoid will continue to be an epidemic in Nassau as long as the present unsatisfactory sanitation exists. We must expect an ever-increasing number of typhoid cases, with I fear a steady increase in mortality each summer, unless modern sewerage is installed, as every year more carriers are certain to be present in the community, and with the general use of open cess-pits, contamination of drinking water and food by excreta is bound to occur.

Gastro-enteritis occurred in epidemic form last summer, especially after a drought, and especially attacked infants, among whom the death-rate was, as far as can be ascertained, fairly high.

Adults were not exempt, and a great deal of suffering and inconvenience occurred. The symptoms were those of severe abdominal pain, nausea, vomiting and profuse watery stools, with in some cases blood and mucus. In many cases these symptoms were accompanied by pyrexia, which, however, rarely mounted more than 102° F. Convalescence was, as a rule, rapid, although many complained of great weakness and lassitude on first getting up. I lay the aetiology of these epidemics to a sudden onset of wet weather after a drought, and the consequent reception of germs and infected material into tanks that are used to store drinking water, also a similar infection of wells. It would be advisable after a long drought if all tanks are first emptied before being used for domestic purposes. Another cause of infection is the dust, which is often blown in clouds about the streets in dry weather, and does not reflect credit on our watering system, which is undoubtedly very defective. Expectorations are another insanitary habit commonly indulged in, and should be put down by legislation if necessary, as dried sputum is a dangerous source of infection to the public health. There have been an increasing number of cases of puerperal sepsis among the lower classes, who usually are not attended by a medical man, but by some local "Sarah Gamp," whose knowledge is medieval, and methods unquestionably dirty. I think the time has come for the registration of nurses, so that some control can be kept over these women, who are undoubtedly the cause of much suffering and even mortality among the misguided women who employ them.

As I have already stated, it is impossible to form any estimate of the death-rate from disease in the Colony, but I hope to be able next year to obtain reliable data, especially with regard to infant mortality, which I fear is exceptionally high. This is due to ignorance, gross ignorance, and poverty among the poorer class. In many cases the mother has to work for her living and leave her offspring to the tender care of a neighbour or older children. There is undoubtedly a tremendous field for child welfare work in Nassau, and the establishment of a crèche would be a great boon to the poorer classes in the community.

Malaria has been more prevalent this year, due to the presence in our midst of many infected returned soldiers and labourers, who have been working in large numbers in the western district of the island, where the anopheles is prevalent, with the result that many of their fellow labourers who were not infected before had become inoculated with malaria, and are spreading the infection. As there is no Government laboratory in the Colony, the diagnosis of malaria in the majority of cases is clinical, and the abatement of the fever and symptoms on the administration of quinine. For my own information I recently examined the blood of two private patients suffering from pyrexia whom I suspected to be victims of the anopheles—one, a resident in the western district, had crescents, and the other, a resident of Nassau, benign tertian rings, which proves we have the simple and malignant types of malaria present in the colony.

The Honourable House of Assembly has voted the sum of £1,000 for an anti-mosquito campaign. This I fear is inadequate, as in order to thoroughly eliminate mosquitoes from New Providence it would require considerably more than this amount of money. I do not see, however, why the city of Nassau should not be practically freed from mosquitoes provided adequate funds are voted and a properly trained and equipped sanitary squad engaged. At present the use of one sanitary inspector, who, although he is a most conscientious officer, can never be expected to cope with the situation. I would like to see the engagement of four additional sanitary inspectors, who should be thoroughly trained in their duties, and the town divided into districts, as is done in West Africa, and a thorough system of inspection and control inaugurated. I personally inspected, with Mr. A. Sweeting, sanitary inspector, dairies, aerated water factories, bakeries and dust heaps: they were all found to be in a fairly satisfactory condition.

VITAL STATISTICS.

Number of inhabitants, 1919	...	...	56,805
Births in 1920	...	...	1,930
Deaths in 1920	...	...	1,213
			<hr/> 717
			57,522
Emigrants...	...	...	5,134
Immigrants	...	...	2,964
			less 2,170
			<hr/> 55,352
Decrease	...	...	...
			<hr/> 1,453

BAHAMAS GENERAL HOSPITAL, NASSAU, N. P.

The first half of the year the staff was not very pleased with their salaries, but after the voting of £900 extra by the House of Assembly for this purpose, the remaining half of the year under review was fairly satisfactory, as far as this item was concerned.

Taking as a daily average 180 persons to be cared for, there were 65,700 persons fed, clothed, and ministered to, at the hospital, direct.

From a monetary point of view £13,000, the amount received from Treasury, seems a large amount, but

after a careful analysis of the various allocations, all ideas of extravagance will be entirely dispelled, when the abnormal high rate of exchange is deducted from this amount.

In caring for the sick, the poor, and the dying unforeseen expenditure must consequently follow, and to achieve a successful issue which is to be appreciated by all concerned is to manfully bear the burden laid upon us.

STANLEY V. S. ALBURY,
Superintendent.

POLICE DEPARTMENT.

The general health of the police for the past year has been very good, most of the causes for going sick have been trivial.

Several men have been laid up for a few days from injuries received in making arrests, but nothing serious.

One man died in hospital from double pneumonia.

Three men have been discharged medically unfit.

Veneral disease has been the cause of ten men coming for treatment this year as against three last year, which looks as if the prophylactic treatment was not being properly used. The use of the prophylactic treatment should be obligatory and men who fail to carry out the order should be punished severely enough to enforce their obedience to the order.

A number of men were recruited in Barbados arriving here February 15. They had suffered a lot from cold and wet and several of them have not quite got over the effects of the exposure yet.

It would be to their advantage to have more stress laid upon games; if the men could get interested enough to keep them off the streets it would be something gained.

REPORT ON PRISON.

The health of the prisoners during the year has been good on the whole.

Inspections at unlooked for times have been made frequently and very little has been found to cause complaint.

There has been some difficulty in impressing on the prisoners the necessity of keeping latrines covered, but that is better than in the past.

There is a great need of some instruction for the female prisoners either in lace making or straw weaving or some other employment along the lines of improvement.

There is so much spare time on their hands that can be used to improve them, and even perhaps make at least some of them self-supporting who now have no means of support except the "oldest profession."

REPORT OF COLONIAL SURGEON, NASSAU.

During this year the health of the poor has been fairly good, no serious epidemic has broken out, but

pertussis and variola have been fairly rife for some months past, and a number of cases of the former disease still exist.

A far larger number of cases of malaria have been seen by me this past year than in any year during my term of office.

Labouring work at good wages has been plentiful and better conditions in general have reacted towards an improved state of health of the poor. I have found that they recover more quickly after an illness than during last year. I have not had to draw so extensively on the hospital for nourishment for them.

I beg to draw your attention to the very unsatisfactory conditions under which the poor labour in the way of competent midwifery attendance.

Any woman, without any training and without the most rudimentary idea of antiseptic or even cleanliness, considers herself qualified to attend a confinement.

There is I believe no registration necessary, nor are there any requirements in the way of examination.

These dirty unqualified women make their victims pay them from twelve to sixteen shillings for their attendance, and in many cases leave their patient with puerperal septicæmia.

In one instance I traced several cases to the one woman attending.

The diseases most prevalent have been gastrointestinal, pulmonary, venereal and malarial.

H. MATHER HARE,
Colonial Surgeon.

BAHAMAS GENERAL HOSPITAL, NASSAU, N. P.

On December 31, 1919, there remained throughout the Institution one hundred and forty inmates.

During the year 1920 there were seven hundred and twenty-three admissions, making a total under treatment of eight hundred and sixty-three.

Three hundred and twenty-one were discharged recovered, one hundred and eighty relieved, thirty-nine unchanged and one hundred and seventy-nine died.

During the year there were one hundred and twenty-seven surgical operations performed under a general anæsthetic in the Alexandra Hospital.

During the months of January and February there were a number of admissions to the medical wards of acute cases of influenza, most of which were complicated by pneumonia, and some ending fatally.

Typhoid fever continues to account for many of our admissions, there being twenty, with four deaths during the year.

The three months post-graduate course in X-ray work, which the Commissioners recommended, was the first in the history of the institution; and I sincerely hope that it is the initiation of a system which will be repeated from time to time.

J. J. CULMER,
Resident Surgeon.

Colonial Medical Reports.—No. 146.—British Guiana.

REPORT OF THE SURGEON-GENERAL FOR BRITISH GUIANA FOR THE YEAR 1920.

By **W. G. BOASE.***Acting Surgeon-General.*SURGEON-GENERAL'S OFFICE,
GEORGETOWN, DEMERARA.

THERE were treated 14,886 in-patients, a decrease of 798. There was an increase in the daily average number of patients. In Georgetown Hospital from 50 to 394 and in New Amsterdam from 91 to 96. Suddie Hospital dropped from 68 to 62. The out-patients numbered 38,242, a decrease of 10,646.

The causes of death enumerated were chiefly enteric fever, malaria and phthisis.

At the Public Hospital, Georgetown, there was an increase in the number of enteric cases compared with 1919, 372 as compared with 226.

The health authorities continue to make efforts to reduce all patients to be isolated in order to avoid the spread of infection, which is believed to be chiefly due to personal contact. Convalescents are subjected to repeated bacteriological examinations before discharge, in order to eliminate the possibility of the spread of infection by carriers.

The number of cases of enteric treated in the isolation ward of the Public Hospital, Georgetown, was 372 with 59 deaths. Of the 372 cases there were 242 from the town with 38 deaths and 130 from the country with 21 deaths. The increased mortality among the country cases is attributed to the fact that they reach the hospital as a rule in a much more advanced stage of the disease and have to undergo the fatigue of a long journey very often.

The mortality from pneumonia was again high. At the Georgetown Hospital there were 92 cases with 51 deaths; 30 cases of broncho-pneumonia with 12 deaths; and 255 cases of bronchitis with 25 deaths.

There were 234 cases of phthisis with 105 deaths at the Public Hospital, Georgetown. Of these 166 were treated in the tuberculosis ward with 73 deaths. The Hospitals at Georgetown and New Amsterdam continued the important work of training nurses, midwives and sicknurses and dispensers; while Suddie Hospital continued to offer candidates for the probationers' examinations. Applications for training still continue to increase especially as regards midwives. It is hoped to revise and improve the training of nurse midwives.

There were 670 deliveries in the Public Hospital, Georgetown, with 33 deaths, and the out-door midwives attached to the hospital attended to 150 cases with no deaths.

At the Public Hospital, New Amsterdam, there were 132 deliveries; at the Public Hospital, Suddie, 10; at Bartica 3, and at Morawhanna 13, making a

total of 1,013 delivered by the trained midwives of these institutions.

I submit an abstract of the report of the Medical Superintendent of the Lunatic Asylum. There was an average daily number of 676 patients. There were 116 admissions as against 142 in 1919, and 72 discharges as against 46 last year. There were 126 deaths. The chief causes were bowel diseases, Bright's disease, old age, scurvy and tuberculosis. The chief causes of insanity among the admissions were senility, adolescence, poverty and want, domestic worries, syphilis, epilepsy and alcoholism.

THE ONDERNEEMING INDUSTRIAL SCHOOL
FOR BOYS.

The average daily number of boys was 167.1: the percentage of sick was 1.58 of the daily average. The chief diseases treated were filariasis and ulcers.

During the year all the boys were examined for ankylostome infection and 50 per cent. were found infected. They were treated with thymol or oil of chenopodium until free. None of the cases were serious.

URBAN DISTRICTS.

In the City of Georgetown there were 1,627 births. The birth-rate is the highest recorded since 1915; there were 1,722 deaths; the infant mortality rate was 212, exactly the same figure at which it stood in 1919.

There were 314 notifications of enteric fever. The first half of the year contributed 202 cases and the latter half 112.

The number of deaths from enteric was 57; malaria caused 80 deaths in the city.

The town of New Amsterdam shows an increase in its births, from 216 in 1919 to 286.

There were 194 deaths.

The infant mortality was 126 per 1,000 births as compared with 231 for the previous year.

Sanitation in the villages is improving, although very slowly, thanks to the efforts of the Public Health Department.

There has been no appreciable change in the water supply which is still very poor quality and deficient in quantity, especially during the dry months.

Drainage in most of the villages is badly needed and much improvement in general health can hardly be expected till this matter and that of a pure water supply is settled.

Latrines are much more used now than formerly.

SUGAR ESTATES.

The half-yearly inspections were carried out as usual.

No indentured immigrants are now left, but the estates' hospitals are still kept up and shew no falling off in efficiency.

There were 1,838 births on sugar estates.

The deaths including all persons dying on the estates, and those from estates dying in the public hospitals were 1849.

ENTERIC FEVER.

There were 795 notifications with 138 deaths in the whole Colony; in the Georgetown Medical District, there were 326 notifications with 80 deaths.

In the country districts there were 165 notifications from the East Bank, Demarara, 87 from the West Bank and West Coast, 69 from the East Coast, 35 from Essequibo and 58 from Berbice.

There has again been a decrease in the number of deaths this year from tuberculosis.

The society for the prevention and treatment of this disease has to record its fourteenth year of useful work.

Arrangements are being made but are not yet completed for a tuberculosis hospital.

This year there has been a considerable decrease in the number of deaths from malaria.

Malaria is indirectly the principal cause of death in this colony, not so much on account of the number of deaths from acute malaria but because of its debilitating effect on the population, and no improvement can be expected until anti-malarial measures are fully carried out.

Quinine is given generally as a prophylactic, but is not always successful in keeping off attacks.

The malaria rate is lower on the estates than in the villages, because the former are under better sanitary conditions.

Ankylostomiasis is treated regularly on sugar estates, with a good deal of success.

There has been no systematic treatment in the villages since the International Health Board ceased operations in this colony.

The infant mortality for the colony was 148 per 1,000 births as compared with 185 for 1919, and for the City of Georgetown 212, exactly the same figure at which it stood during the previous year.

Since July, 1908, an out-door maternity department has been maintained at the Public Hospital, Georgetown.

The Baby Saving League now employs twenty-two midwives, working in the country districts.

The infant mortality rate, whilst still high, shews a considerable decrease on last year, and may be expected to decrease still further when more league nurses are established in the districts.

The still-birth rate is very high, and will scarcely be reduced until more nurses and better attendance is available for mothers.

PUBLIC HEALTH.

County sanitary inspectors, under the health officers, supervise the work generally in their counties, and have already shown the value of their appointments.

Systematic oiling of latrines with crude carbolic oil

in the districts have been done during the year with very good results.

QUARANTINE.

During the year quarantine restrictions were in force for yellow fever and small-pox. No cases of these diseases have occurred in the colony during the year.

Twenty-two vessels were visited under the Quarantine Ordinance by the port health officer, Georgetown, and forty-nine passengers placed under surveillance—forty-one for yellow fever and plague and eight for small-pox.

Three vessels were fumigated during the year.

VENEREAL DISEASES.

In conformity with the report of the Royal Commission on Venereal Diseases microscopic diagnosis and Wassermann reaction are available for all practitioners by the bacteriological department. Leaflets have been issued and attention is given to the subject in the lectures to nurses, dispensers, &c. Treatment for such cases is carried out in all the public hospitals, and includes the use of organic arsenic.

PUBLIC LUNATIC ASYLUM, BERBICE.

SANITARY ARRANGEMENTS AND DRAINAGE.

The septic tanks in the officers' quarters continue to work well. The ancient and primitive method of removal of excreta from the blocks remains in force.

Water Supply.—Pipe water supplied by the Town Council, New Amsterdam, and the rain water collected in tanks and vats have proved sufficient for the needs of the institution.

Dietary.—On the whole, the dietary of the attendants and patients was good. There was, however, a shortage of green vegetables for about six months (April to October) resulting in a mild outbreak of scurvy amongst the patients (roughly about 8 per cent. were affected) during September and October. One female attendant developed spongy gums. I understand that there was a shortage of green vegetables throughout the colony for a portion of the year. The prison farm certainly failed in their supplies to us for the period mentioned.

Between 350 and 400 antityphoid inoculations were performed amongst the staff, attendants and patients.

The conduct of the attendants was good on the whole. One female and four male attendants were dismissed. One male and two female attendants resigned. One female attendant absconded, and one female and three male attendants were found to be physically unfit for duty.

The chief diseases treated were diarrhoea, dysentery, malaria, Bright's and pulmonary complaints. It has already been mentioned that there was a mild epidemic of scurvy during September and October.

The Asylum Attendants' Band played twice a week

on Mondays and Thursdays) throughout the year. Examinations were occasionally held on wet afternoons.

The cricket field which is kept in excellent order, has proved a source of much pleasure and benefit to both patients and attendants.

Independent reports by an officer of the Auditor General's department are made from time to time.

Half-yearly reports on condemned and unserviceable articles and stores by a Board consisting of the medical superintendent, the commissary of taxation and the district engineer are made to the Governor.

The patients' case registers are written up to date

and the clinical notes have been carefully recorded by the medical officers during the year.

The rules and regulations of the asylums made by the Honourable the Surgeon-General under Section 7 of Ordinance No. 16 of 1905 and approved by the Governor on January 24, 1907, have been enforced.

My very best thanks are due to the assistant medical officers and the steward for their valuable assistance.

A. C. L. LAFRENAIS,

Medical Superintendent,

Surgeon-Captain B. G. Militia.

Colonial Medical Reports.—No. 147.—Cairo.

REPORT OF THE MEDICAL OFFICER OF HEALTH, CAIRO CITY, FOR THE YEAR 1920.

By P. G. S. WILLIAMS.

Medical Officer of Health, Cairo City.

VITAL STATISTICS.

Population.

It was estimated by the Statistical Department at the beginning of the year that the mid-year population of Cairo in 1920 would be 761,300, consisting of 88,530 Egyptians and 72,770 foreigners.

This estimate must be considerably below the true figure, for, were this correct, the population would have diminished by 387 since the census of 1917. It is a fact, however, that never has Cairo been so crowded as in 1920. Vacant houses and flats have been generally unobtainable. This crowding has been due in part to cessation of building during the war and in part to the normal tendency to immigration from rural districts into towns. The last-mentioned factor received a powerful impetus from the unexampled prosperity of the country during 1920 resulting in a great influx of provincials who bought houses in Cairo and came there to live. In arriving at the estimate above mentioned, immigration and emigration are left out of consideration except in the figure taken to represent the probable increase during the first six months of the year.

Another factor in producing too low an estimated population is the fact that deaths of non-residents have been included in the figure for deaths since 1917. These deaths should properly be excluded from Cairo deaths.

Whatever means are taken to exclude errors, however, it is unlikely that a close estimate of population could be arrived at, for the influence of the war has been such that calculations based on normal years as were those of 1907-17 are likely to prove fallacious.

Births.

There were 35,984 births in Cairo during 1920, of which 35,328 were among natives and 656 among foreigners.

This total shows an increase of 4,010 births over the total of 1919, and is, moreover, the largest

number of births which has occurred in any year for the last seven years at least.

The annual birth-rate was therefore 47·3 per thousand of population as against 42 in 1919.

The mean annual birth-rate during the last five years was 42 per thousand, the highest rate during this period being during the present year, whilst the lowest occurred in 1917 which was 35·8.

Stillbirths.—During 1920 there occurred 1,339 stillbirths, as against 1,215 in 1919.

Of this total 1,321 were among natives and 18 of foreign parentage.

Deaths.

The mortality during 1920 was small. The total number of deaths which occurred in Cairo was 28,701, of which 1,082 were deaths of non-residents. Therefore the total of Cairo proper was 27,619 which, with the exception of 1917 when the number was 26,804, is the lowest during the last six years.

Of the total deaths of Cairo residents 26,669 were native deaths and 950 foreign.

The mean annual death-rate during the last five years was 40·5 per thousand of population, the highest rate during this period being 49·4 in 1918 and the lowest in 1917 being 35·8.

Infantile Mortality.

The total number of infantile deaths during 1920 was 9,342. This includes 178 deaths of children from outside Cairo which occurred in various public institutions. The total deaths belonging to Cairo proper was 9,164, which is equal to a death-rate of 255 per thousand births as compared with 238 in 1919 and 329 in 1918. The main cause of the infantile deaths was diarrhoea which was very prevalent during the hot weather. This disease accounted for 3,595 deaths.

The mean annual infantile death-rate during the last five years was 241 per thousand births, the highest rate during this period being 329 in 1918, and the lowest 238 in 1919.

INFECTIOUS DISEASES.

The total number of cases of infectious diseases notified during 1920 was 6,959, excluding those coming from outside Cairo. Considering that 1,564 of the total are cases of influenza which was added to the list of notifiable diseases in August, 1919, the year 1920 compares very favourably with the previous six years.

The total number of the eight principal diseases was 4,838, this being the lowest total (excepting 1917) during the last seven years.

With the exception of measles, the amount of infectious disease that occurred was comparatively small.

The annual summer epidemic of typhus, which had been very severe during the two previous years, was much lighter than usual.

There was also a diminution in the amount of typhoid fever.

In fact taking the average number during the last five years, all the diseases, excepting measles and cerebro-spinal fever, were below the mean.

Small-pox.—The number of cases of small-pox notified during 1920 was 157, as against 1,455 in 1919. The ratio of deaths to cases recorded was, however, not very much smaller than in the previous year: Forty-one out of the fifty deaths from this disease were diagnosed after death; that is to say that there had been no medical attendance and the cases had not been notified.

Measles.—The total number of cases of measles during the present year was 1,325, and this is the highest number for at least nine years. The rate of cases notified per thousand of population was therefore 1.685.

The ratio of deaths to cases recorded varies a great deal in the different districts and ranged from 91.2 per cent. in Old Cairo to 8.6 per cent. in Shâbra, whilst the ratio for Cairo City was 30.5.

Scarlet Fever.—There is nothing particular to remark on the incidence of this disease; the total number of cases was the same as in 1919, namely only thirty-nine. The number of deaths also was the same as in the previous year.

Diphtheria. The total number of cases recorded during 1920 was 329, which is the smallest for at least nine years. The ratio of cases to deaths was also low in comparison with former years.

Typhoid Fever. The total number of cases during the year was 925, which is the lowest since 1913.

Typhus Fever.—Although still prevalent during the year, was very much less severe than, at any rate, the two previous years, the total number of cases being 1,606 against 1,825 in 1919 and 1,433 in 1918.

With the object of attacking the source of this disease (as well as relapsing fever) a delousing campaign was started during March. A man and a woman who have been specially trained in the work go out with each disinfecting gang to the house of the case. If, on examination of the contacts, lice or nits are found, the contacts are bathed and all hair is shaved from the body whenever possible. When objections are made to this procedure, washing with petroleum solution is carried out instead. The

hair of the head is also thoroughly washed and soaked with the solution. The clothes are disinfected. The whole operation is repeated on the seventh day if considered necessary and the clothes re-disinfected. To do this thoroughly takes so much time and supervision that it has not been found possible to delouse in this way the contacts of all cases. Two of the women engaged in this work contracted the disease.

Arahic handbills were distributed detailing the best methods of exterminating lice, as a precautionary measure against typhus and relapsing fevers.

The *Fatwa* of the Grand Mufti of Egypt was read in Waql mosques and posted about in prominent places in the native quarters.

This *Fatwa* explains that typhus and relapsing fevers are contagious and epidemic diseases, that they are communicated from one person to another by means of the louse, and recapitulates the teaching of the Mohammedan religion regarding contagious and epidemic diseases and the duty that is incumbent on every Muslim to protect himself against them.

An outbreak of typhus of some severity took place at the village of Kafr el Gamûs, population 1,200, near Matârtiya, included this year within the circumscription of Cairo. This disease was discovered on March 19, and the last case occurred on June 20. There were fifty-three cases in all. The village officials strove in every way to conceal the disease and on pleading that removal of cases to the fever hospital was the cause, were allowed to have an isolation camp just outside the village. The only response to this concession was the concealment by the Sheikh el Beled and Sheikh of *ghuflirs* of typhus cases in the persons of the sister of one who was aunt of the other and also of the wife of the official telephone operator. These cases were discovered only after death, when concealment was no longer possible.

The sanitary barber of the village was dismissed by us and the 'Omda and Mashaiekh dismissed by the Ministry of the Interior.

Relapsing Fever.—The total number of cases notified during the year was 429, giving a rate of 0.545 cases recorded per thousand of population.

Cerebro-spinal Fever.—There were twenty-eight cases during the year, with fifteen deaths. A small outbreak of this disease took place at the end of January and during February among the police recruits who were lodged at the Old School of Commerce, Sharia El Khalig el Masri. There were nine cases in all and the disease appears to have been introduced from the Faiyûm. In view of what has been written concerning the incubation period of cerebro-spinal meningitis the dates of incidence of these cases are not without interest, viz., January 31, February 1, 8, 12, 13, 18, 22, 23, and 24. All clothes and bedding were disinfected and the men distributed as widely as possible in the various rooms of the building. The arrangement found in force, of a common mug and a bucket of drinking water in which to dip, was abolished; water taps were appointed as the sole source for drinking water and each man was provided with his own mug. Under these measures, the epidemic was quickly suppressed. One case only occurred after they were put into force.

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Puerperal Fever.—The total number of deaths notified from puerperal fever during 1920 was 48, of which 43 were among natives and 5 among foreigners. This gives a death-rate of 0.062 per thousand of population and 1.333 per thousand births. In addition to these 48 deaths, there were 30 others which took place within a fortnight of confinement. The cases assigned to these were: peritonitis 3, eclampsia 7, difficult labour 3, typhus 2, heart disease 5, hæmorrhage 5, influenza 1, pneumonia 3, and abortion 1.

Influenza (and Respiratory Diseases).—This infectious disease became notifiable in August, 1919, and during 1920 the number of notifications were 1,587 with 130 deaths recorded. This gives a case-rate of 2.019 per thousand of population and a death-rate of 0.165 per thousand of population. The ratio of deaths to cases was 8.2 per cent.

The following prophylactic measures were taken with a view to prevent the spread of the disease: Posters in Arabic, English, French, Italian and Greek were put up in various quarters of the town and in tram cars, and handbills distributed giving in brief the manner in which the disease is contracted and the precautions to be taken against it. The measures to be adopted, when attacked or when nursing a patient affected with it, were also detailed. Instructions were sent to the tram companies as to the necessity of keeping the trams ventilated during the journey, and of leaving the doors open until they start on the return journey. Theatres and places of amusement were required to leave an interval of at least an hour between successive performances, during which time a thorough ventilation of the interior of the building was to be effected by opening all doors and windows.

In view of the fact that the cause of death in influenza has so frequently been pneumonia and broncho-pneumonia in the serious epidemics of recent years, a comparison of the recorded deaths from influenza with those certified as being due to pneumonia and broncho-pneumonia is not without interest. Such a comparison is even of considerable value when an epidemic is threatening in view of the possibility of the influenzal origin of cases of pneumonia being overlooked. It happens that this year there is nothing remarkable to be observed in the comparison.

The deaths due to respiratory diseases, excluding tuberculosis, amounted to 4,099; these comprise 1,518 of pneumonia, 2,269 of bronchitis, 39 of pleurisy, and 273 of other respiratory diseases.

Encephalitis Lethargica.—During 1920 six cases of this disease were notified. One of these came from Kharga Oasis, while the other five were residents of Cairo. One case was notified from Ezbekiya, one from Shubra, one from 'Abdin, and two from Sayyeda. The first case was notified from Ezbekiya on June 10. All died with the exception of the case from Ezbekiya. The symptoms of the first two cases were reported to be as follows:—

Case 1.—R. A., aged 12, male, schoolboy. Was last at school on May 22. Started with headache

and general weakness. When seen on June 13 he had slight fever, stupor, could be roused to answer questions, but went to sleep again. No diplopia, no squint, no facial paralysis. Pupils dilated and fixed; muscles of limbs "paralysed." No history of recent illness in patient or family. Sanitary conditions of the house bad. Mother stated that his condition was improving. Not so drowsy as he had been. Recovered.

Case 2.—T. A., aged 17, male, student. Was last at school May 27, started with headache and general weakness. When seen on June 13, temperature was 37.5° C. in morning and 38.5° C. in evening. Lies on his back in helpless state. Drowsy, but could be roused, after which he at once went to sleep. Could hardly open his eyes. Diplopia, pupils dilated and fixed. Spasmodic contraction of the face. Difficulty in speech. Muscles of limbs "paralysed." Slight incontinence of urine. Constipation. Sanitary condition of house good. No history of recent illness in patient or family. Died June 23.

Steps taken: (a) A circular letter was sent to all practitioners in Cairo drawing their attention to the disease, and asking them to notify all cases. (b) Also to medical officers of districts to notify all cases and to give a full report of each case. (c) Every case was isolated and disinfection done after death or recovery. (d) Every case which could not be isolated in his or her own house was sent to the fever hospital.

Anthrax.—Infected Shaving Brushes.—On August 20, 1919, an officer of the R.A.M.C. reported verbally to the principal medical officer of health that three cases of malignant pustule on the cheek had occurred amongst the troops at Qantara, and that in each case the patient had recently bought a shaving brush from the same consignment. This consignment had been received in June, 1919, from a firm in Cairo, who had imported 500 dozen from Japan in May, 1919. A shaving brush of this consignment was bought and examined by the R.A.M.C. officer who found it to be swarming with anthrax bacilli. Specimens were obtained by the inspectorate from the remainder of the stock still in possession of the Cairo firm and sent to the Public Health Laboratories for analysis. The results of the examination of the R.A.M.C. medical officer were fully confirmed. The brushes still in possession of the firm were bought up by the inspectorate and destroyed. The remainder had by this time been sold and widely distributed to such places as Alexandria, Mansúra, Jerusalem, Jaffa and Beyrout.

Arrangements were made by the department for the examination of specimens of future consignments before being released from the Customs. Several consignments from Japan were found to be infected, and one, at least, was returned to Japan.

In view of the danger to the public, Law No. 21 of 1920 was promulgated on May 29, 1920, regulating the importation of shaving brushes into the country. This law forbids the importation unless accompanied by a certificate from the competent authority of the country of manufacture to the effect that the hair has been submitted to a disinfection recognized as being sufficient for anthrax. Notwithstanding this certifi-

cate the sanitary authority can always stop delivery from the Customs until a bacteriological examination of specimens has been made. Infected consignments can be destroyed without compensation or may be authorized by the sanitary authority to be re-exported to the country of origin. Another article empowers the Ministry of the Interior—by decision of the Council of Ministers—to prohibit the importation of shaving brushes from any country under certain circumstances.

DISINFECTION SERVICE.

During 1920 the total number of rooms disinfected by the two Services of Abbāsiya and Fum el Khalig was 25,169. In addition to these disinfections 241,760 articles of clothing were removed by the two services for steam disinfection.

Delousing.—During the year, a delousing campaign was instituted against typhus and relapsing fever. Four male and four female delousers were attached to the Abbāsiya staff and three male and three female delousers to the Fum el Khalig staff. The total number of contacts deloused during the year was 1,979, of which 1,102 were females and 877 males. One male and one female delouser were appointed to each complete gang at the disinfecting stations.

GOVERNMENT FEVER HOSPITAL, ABBASIYA.

The Epidemic Cordon.—Still consists of a great number of highly unsuitable mat huts. Asbestos-cement sheeting was obtained from England in the autumn for the erection of proper pavilions, but the absence of a credit for their construction prevented anything from being done.

Water Supply.

In April the water supply of the hospital became seriously deficient in quantity. This had occurred at times in previous years, but on the occasion in question parts of the hospital such as the kitchen, laundry, and certain of the W.C.s, were without water.

It became necessary therefore to take immediate action in the matter. This was done, and in a commendably short space of time the 6-in. main, hitherto stopping short at the gate, was continued a sufficient distance into the hospital grounds to provide an ample water supply and the internal canalization was partially remodelled. The water mains are now adequate for all calls that may be made on them.

Summary of Admissions.

During the year 1920 there were 3,152 admissions to the Government Fever Hospital. Of these admissions, 2,452 were males and 700 females. The admissions consisted of 109 cases of small-pox, 54 chicken-pox, 43 measles, 9 scarlet fever, 172 typhoid fever, 918 typhus fever, 568 relapsing fever, 17 cerebrospinal fever, 59 diphtheria, 20 mumps, 546 influenza, 8 erysipelas, 9 paratyphoid, 1 para-Malta, and 619 other cases consisting of 342 cases sent to hospital under mistaken diagnosis of infectious diseases, 161 persons sent in under observation in whom no

disease of any sort manifested itself, and 113 mothers of young children and other persons accompanying patients. The 342 cases sent to hospital under a mistaken diagnosis of infectious disease were found on examination to consist of 53 of gastro-enteritis, 44 malaria, 40 pneumonia, 39 bronchitis, 14 tuberculosis, 4 whooping-cough, 23 tonsillitis, 18 dysentery, 9 rheumatism, 12 various skin diseases, and 86 other cases of a most diverse nature consisting of syphilis, prolapse of uterus, gangrene, tumour of brain, heart disease, mania, &c. Eighty-three were first class, 290 second class, and 2,779 third class.

The admissions from the eight principal notifiable diseases (small-pox, measles, scarlet fever, diphtheria, typhoid fever, typhus fever, relapsing fever, and cerebrospinal fever) were 1,895.

From the hospital admissions, however, should be deducted 42 military patients.

There were 452 deaths in the hospital during 1920 or, estimated on the 3,152 admissions, 14·34 per cent.

In addition there were 27 deaths amongst patients sent in under a mistaken diagnosis of infectious disease and whose condition on arrival did not permit of a refusal of admission. These were 5 acute bronchitis, 2 senility, 4 dysentery, 1 premature labour, 4 military tuberculosis, 2 peritonitis, 1 rheumatic fever, 3 gangrene of legs, 4 heart diseases, and 1 encephalitis lethargica.

Included amongst the male admissions were 429 sick convicts from the Cairo prisons. Of these, 60 were suffering from typhus, 27 from typhoid, 8 from measles, 124 from influenza, 1 from erysipelas, 147 from relapsing fever, 1 from diphtheria, 1 from cerebrospinal fever, 4 from malaria, 10 from mumps, 2 from tuberculosis, 3 from pneumonia, 3 from bronchitis, 3 from tonsillitis, 8 from enteritis, 1 from dysentery, 2 from skin diseases, 2 from glands in the neck, 1 from pleurisy with effusion, 1 from liver abscess. Twenty of the observation cases sent in under mistaken diagnosis were found not to be suffering from any disease.

Of the convict patients 32 died, death being due to typhus in 16, typhoid in 8, influenza in 2, cerebrospinal fever in 2, relapsing fever in 1, pneumonia in 1, and dysentery in 1. The convict case-mortality was therefore 7·4 per cent. of the total number of convicts admitted in 1920.

DEATH INQUIRIES.

During 1920 the number of uncertified deaths, which required investigation because they were deaths of persons who had received no medical attendance during their last illness, was 18,814. Therefore the proportion of uncertified deaths to the total deaths which occurred in Cairo is 68·1 per cent. as against 70·7 per cent. in 1919 and 72·1 per cent. in 1918. This is the lowest percentage for some years although the proportion still remains very high.

VACCINATIONS.

During 1920 there were 40,051 vaccinations carried out by the medical officers of the inspectorate and districts. Of this total 30,623 were primary vaccinations, 30,215 of which were of native children and

408 of children of foreign birth. The remainder were secondary vaccinations of contacts of small-pox or of persons voluntarily applying for this. Of these revaccinations 9,174 were vaccinations of natives and 257 of foreigners, whilst 9,151 were carried out by the district medical officers and 280 by the medical officers of the inspectorate.

PASSENGER AND PILGRIM CONTROL SERVICE.

Passenger Service.

During 1920 the total number of passengers arriving in Cairo and requiring to undergo a period of observation, on account of coming from countries under supervision on account of being infected, was 7,951. This shows a considerable increase over the previous year, which had a total of 4,288.

The largest number of passengers came from Syria (2,958), whilst Turkey and Greece come next in numbers, viz., 2,301 and 1,746 respectively.

Of the total number of passengers, 4,639 or 58·3 per cent. landed in Alexandria, 2,542 or 32 per cent. in Port Said, and 770 or 9·7 per cent. in Suez.

Besides the above there were also 19,646 Egyptian Labour Corps men coming from the Canal zone who required to be observed on their arrival in Cairo. Apart from these 19,646 Egyptian Labour Corps men who had been notified to us from Qantara there were 1,914 Labour Corps men who had not been notified to the inspectorate but who presented themselves for observation.

Pilgrim Service.

During 1920 there were 72 passports issued by the governorate to residents of Cairo wishing to make pilgrimage to Mecca. Besides these 75 government employees were given permission to accompany the Mahmal. Out of the 72 persons who had passports 71 returned from the Hedjaz and underwent the usual period of observation. The one presumably remained behind, as is sometimes done. Of the 75 employees 74 returned, while one did not leave Cairo for the pilgrimage.

SANITARY CONTROL OF PUBLIC WOMEN.

Examination Rooms for Native Prostitutes.

The total number of women on the registers during 1920 shows a further diminution, as compared with the last six years, being 1,486 as against 1,601 in 1919 and 1,573 in 1918.

During the year, 342 names were struck off for various reasons, leaving 1,144 at the end of the year, a total which differed but little from that at the end of the previous year.

The number of examinations carried out during the year was 34,485, as compared with 21,980 in 1919. This shows an average of 23·2 examinations per woman.

Bab el Shariya and Ezbeqiya.—The number of women registered in these districts was 1,237, being 112 less than in 1919. Of these 257 were struck off during the year, leaving a total of 980 on December 31. The total of examinations held was 30,064, as against 21,829 the previous year, showing an average of 24·3 examinations per woman.

Abbasiya.—The number on the books during the

year was about the same as in the previous year, being 150 as against 151. Those remaining at the end of the year were, however, only 78. The number of examinations carried out was 2,311, which is an average of 15·4 examinations per woman. The number of absentees at the weekly examinations is considerable.

Saigeda Zeinab.—The total number of registered women in this district was 99, as against 101 in 1919. Out of this number 13 were struck off during the year, leaving 86 on the books at the end of the year. The examinations held totalled 2,110, making an average of 21·3 per woman.

Diseases.—The total number of cases of disease discovered as a result of the examinations was 2,559. The actual number of women who were diseased was 247. All these were sent to hospital for treatment. The total number of cases of syphilis discovered was 225, as compared with 194 in 1919. This shows an increase of 31. The number of cases found whilst in the secondary stage was considerably greater than in the previous year, the figure being 186 as compared with 113 in 1919, whilst the primary cases were 42 less than in the previous year. There were 2,171 cases of gonorrhœa, of which 127 were acute and 2,044 chronic. This shows a diminution of 326 on last year's figures.

European Examination Rooms.

The total number of women on the registers during 1920 was 393 as against 437 in 1919. Out of this total 46 were new names, whilst 126 were struck off for various reasons, such as old age, giving up the life, or having been transferred to the class which sends in weekly certificates from private practitioners. There were, therefore, 267 names on the books at the end of the year. During 1920 there were 9,894 examinations held, which gave an average of 25·2 examinations per woman. As a result of these weekly examinations 305 cases of disease were discovered, giving a percentage of 3·1 per cent. of examinations revealing disease. The actual number of women who were found diseased was 189.

European Lock Hospital.

During 1920 there were 371 admissions to the hospital. This total included 305 cases from among the women who undergo a weekly examination at the European examination rooms, while 66 belonged to the class of prostitutes who send in a weekly certificate from private practitioners.

The average number of days in hospital was 16·0. Out of this total number of admissions 38 were suffering from syphilis, i.e., 5 primary, 31 secondary, and 1 tertiary. The average number of days in hospital for this disease was 19·2.

The total number of cases of gonorrhœa was 295, made up of 15 acute, 6 sub-acute, and 247 chronic. The average period of detention of this disease was 16·1 days.

There were also 7 cases of chancre which remained in hospital on an average 21·1 days.

Besides these there were 31 cases admitted under observation and who eventually proved to be free of disease.

In last year's annual report it is stated that confinement in any hospital, to a person who does not feel ill, is extremely irksome, and that, where less freedom can be given than in an ordinary hospital, the confinement becomes more irksome still.

The extreme dislike of the women to admissions to hospital was the cause of some trouble during the spring of 1920.

Owing to the fact that the number of admissions had been unusually high the women refused, on March 1, to attend for weekly examination. Complaints of being sent into hospital unnecessarily, of being kept in too long, and of being improperly treated, were made to certain of the Consuls. An inquiry showed the complaints to be without foundation, but it was not until after the lapse of about a month that the examinations were resumed.

UNHEALTHY, INCONVENIENT, AND DANGEROUS ESTABLISHMENTS.

Under the Law of August 28, 1904, and the Arrêté of the Ministry of the Interior of August 29 of the same year, 1,540 establishments, coming under this office, were licensed during 1920 after the fact of compliance with the conditions of exploitation had been verified by inspection, as compared with 1,512 in 1919.

In last year's report, attention was drawn to the small staff provided for inspection of establishments already licensed, and the principle was enunciated that the strength of staff to be aimed at is one overseer for each of the fifteen districts of Cairo and two others for milk samples and inspection of foodstuffs.

A commencement has been made in this direction by the appointment as overseers of four men of a higher standard of education than those already employed. These four men, after some months of careful training under the inspector of overseers, commenced their work in July, 1920. It is to be expected that with these overseers, and especially when their numbers are increased, the standard of sanitation in establishments mentioned on the schedule will be considerably raised. Evidence of improvement is already forthcoming.

Bakeries, confectionery shops, poulterers' shops, dairies, and milk shops gave the most frequent cause for complaint. Bakeries have always given trouble on account of faulty arrangements for smoke removal and insufficient frequency of whitewashing. The latter defect was also very common in the other establishments mentioned. Butchers' shops, grocers' shops, and greengrocers' shops were found to be the most satisfactory.

The number of milk samples taken was 1,186. Of these, 339 were found adulterated and 847 genuine.

The number of samples of aerated waters taken was 243. Of these, nineteen samples only were found to contain lactose fermentation organisms in 10 c.c. The factories from which samples gave unsatisfactory results were reinspected, the condition of the licences verified, and a time limit was given to carry out the lacking measures. Failure to comply was followed by legal proceedings. At the same time the floors of such factories, the water tanks where

bottles are soaked, and the storage water tanks were washed with boiling water under the supervision of an overseer. In nearly all cases these measures gave the most satisfactory results.

Prosecutions for offences connected with the practice of medicine have fallen from twenty-one in 1919 to four in 1920. This is largely due to the fact that eleven of the prosecutions in 1919 were for illegal practice of dentistry. A new Dentistry Law was, however, promulgated in February, 1920, which enabled a certain number of persons, hitherto unauthorized, to obtain permits to practise this profession.

The great decrease in the amount of infectious disease during 1920 is responsible for the diminution in the number of prosecutions.

Of the prosecutions for breaches of the law, "Pharmacy and Sale of Poisons," three were for illegal sale of cocaine and morphine. In one case a conviction was obtained. The other two cases are still pending.

The increase in the number of prosecutions connected with the Law on Inconvenient, Unhealthy and Dangerous Establishments is due to the fact that four new overseers have been appointed and the conditions of exploitation more strictly enforced.

MEDICO-LEGAL AND POLICE.

The Principal Medical Officer of Police reports that the following improvements have been introduced by him during the year:—

At every police station and outpost suitable arrangements from a medical point of view have now been made for the reception and examination of the injured: a first-aid chest has been provided for each police unit, and the police officers have been instructed in the elements of first aid.

Every motor of the fire brigade has also been supplied with a specially constructed medical chest.

All new men joining one or the other of the different branches of the police force: *ghafirs*, detectives, &c., are now vaccinated, and an anti-lice campaign has been instituted with the object of preventing typhus and relapsing fevers in the ranks of the police force. Qism latrines and detention prisons are medically inspected and rules laid down for keeping the places in a sanitary condition.

Barracks and kits of policemen are also being medically inspected by him.

These are very valuable measures and should contribute greatly towards the maintenance of good health among the police and the comfort of the injured.

ANTI-MOSQUITO MEASURES.

The work carried out against mosquitoes in 1920 remained the same as in 1919. The anti-mosquito measures were applied only in certain selected areas where a sufficient number of inhabitants had agreed to allow access to their premises for the purpose of dealing with possible breeding places.

The numbers of complaints about mosquito prevalence were very few. The Gezira area has benefited very materially from the drainage work carried out there by the main drainage department.

Colonial Medical Reports.—No. 147.—Cairo (continued.)

Helwán.

The mosquito problem at Helwán divides itself naturally into two parts, according to the variety of mosquito, the measures of suppression required being different in the two cases.

(a) The *Culex* mosquito is the variety almost exclusively found in the town. The work of suppression is carried out by the local council in the ordinary way by oiling the cesspits and collections of water, emptying barrels, &c.

In consequence of the representations made to the Medical Officer of Health, a medical officer, expert in mosquito prevention work from previous experience in the Sudan, was sent by Cairo inspectorate to Helwán to make a careful survey and to report to the inspectorate.

Six weeks were spent in daily observations. A map was made showing the position of every cesspit and collection of water in the town. The chief breeding places were found to be cesspits—wells—store water tanks, and garden fountains, wooden barrels in gardens, hooses, or inside houses.

A variety of waste water disposal not uncommon at Helwán and very difficult to deal with is the *magrār*, an underground channel with uneven floor lying from a few centimetres to 1 metre below the surface of the ground and from 2 to 10 metres in length. Water collects in small pools in the uneven floor. These *magrārs* are usually inaccessible so far as oiling is concerned.

Recommendations were made by the inspectorate for correction of the defects observed in the arrangements in force and the modifications necessary to put the work on a proper footing were detailed.

(b) *Anopheles* mosquitoes are found around the outskirts of the town, mainly in the collections of water resulting from the various springs.

The springs of Helwán may be briefly described as follows:—

(1) Spring between kilometres 23 and 24 of the Cairo-Helwán railway line, running northwards in two stone-built channels on either side of the line. *Anopheles* mosquito larvæ were found. The railway administration is taking steps to drain off the water.

(2) Pools in holes on the golf course, used for watering the links. *Anopheles* larvæ found. The main drainage department of Cairo, acting for the Anti-Malarial Commission, has deepened these, lined them with rubble so as to leave a 50-cm. shaft, and provided the opening with a well-fitting cover.

(3) Dilapidated well about 500 metres west of Tewfik Palace Hotel.

(4) "Bir el Hadid." A spring about 300 metres west of the hotel last mentioned.

(5) "Bir Hanem." A sulphur spring at the western end of Zaki Pasha Street. By changing, from time to time, the course of the water that finds its way out of the sides of the circular wall built round the spring and filled up with sand, the water, after running down the hill, can be prevented from forming pools at the bottom, it being then absorbed by the sand.

(6) The bath spring and the two springs near it, the latter being free and used by the poorer classes for bathing. These are sulphur springs.

The overflow from these three springs is collected into a properly built drain and led away into open ground beyond the railway embankment more than a mile distant to the south-west of Helwán.

(7) Certain sulphur springs north of the aerodrome, not always in evidence.

(8) Two aerodrome springs. The military authorities drained these during the course of the year.

(9) Spring at 'Ezbet el Qibliya. A sulphur spring now covered up. The water, however, finds its way out at the north-north-east of the village.

(10) Water collection in quarry holes about 200 metres east of El Hayat Hotel percolating from the cesspit. *Culex* larvæ only found.

(11) Four pools in old quarries resulting from overflow of the town reservoir and free water fountain. No larvæ found. When last inspected these pools were drying up owing to representation made.

The measures required to be taken in dealing with these springs, the pools resulting from which afford breeding grounds for the *Anopheles* mosquito, are quite different from those found efficacious in keeping down the *Culex* mosquito in the town.

When the quantity of water is small, the precautions consist in changing, from time to time, the direction of the stream in order to secure the absorption of the water by the sand.

When the quantity of water is large, this has to be conducted to a sufficient distance to allow the formation of pools at a safe distance from the town. The oiling of pools in the open air is of little use unless the pools are very small, as the wind blows the oil off large areas of the surface.

It has been said that cases of malaria have at times been known to occur in Helwán itself. The inspectorate has no information that the accuracy of this statement has ever been established by blood examination of the so-called cases.

Tradition runs that some years ago, signs of malaria were detected in certain of the inhabitants of the southern village ('Ezbet Helwán el Qibliya) close to the site at which the aerodrome has been constructed. This is not at all improbable, as the neighbourhood is one in which *Anopheles* mosquitoes could generally be found, and the existence of these mosquitoes always constitutes a potential danger.

RAT-CATCHING SERVICE.

In consequence of complaints received from various Government offices of the prevalence of rats, of destruction of official documents and of other inconveniences, a rat-catching service was started on January 1, consisting of a foreman and two men.

The number of complaints received during the year was sixty, of which eighteen were from Government offices and foreign agencies and forty-two from private individuals. The total number of rats caught was 4,979.

MISCELLANEOUS.

Refuse Disposal.

A note on this subject was made in the Departmental Annual Report of 1916. The salient points of that note—supplemented by comments—are the following:—

In the year 1916 the total quantity of refuse collected by the carts of the scavenging and watering service was calculated to be 279 tons per day, the calculation being based on the estimate that a cart-load of refuse carried by a simple dust-cart weighs one-third of a ton and by a double dust-cart two-thirds of a ton.

The three methods of disposal employed are : dumping on some convenient site, sale to native baths for fuel, burning in the destructor.

The last-named is, of course, by far the most satisfactory method of disposal, but when from the nature of the refuse the proportion of burnable material is small, as in the case in Cairo, this method of disposal presents difficulties.

The sale of refuse to the native baths for fuel is carried on, not on account of the revenue it brings to the Government, but because most of the baths would have to close if not allowed to use street sweepings for this purpose, the price of wood or coal being far beyond the means of their proprietors.

Dumping the refuse on some convenient site is a method of disposal peculiarly well suited to Cairo on account of its desert surroundings, though the great difficulty in this connection is that of transport.

The refuse dumps at present in use are the following:—

Madbah dépotoir. Already in 1916 this had become a high mound of refuse.

'Abbāsīya dépotoir, an immense uneven area on the northern slope of the hill on which is situated the old reservoir of the water company. Many very large holes in this area are being filled in and the level of the whole raised to form a smooth slope leading down to the road. The filling-in is useful from the point of view of the public works administration, for, when completed, the whole neighbourhood will be much improved and the Tanzim department propose to plant trees on a part, at least, of the land. This dump has replaced the Husseinia dépotoir.

At Giza a very large deep crescent-shaped pond has for years been employed as a dépotoir and is not yet filled.

The scavenging and watering service was transferred from the public health department to the main drainage department in the spring of 1919.

Daily Output.

One-hundred and sixty-eight single dust-cart loads are daily delivered to native baths, as fuel, against payment of 10 milliemmes per load, and 30 tons per day are burnt at the destructor.

A single cart load is reckoned at about one metre and at about one-third of a ton weight.

The Mulid el Nabi festival was held at 'Abbāsīya on November 22, 23, and 24, on a large scale for the first time since the outbreak of war. It has been calculated that on the last day of the Mulid the number of visitors was approximately 10,000.

The sanitary requirements were provided for and supervised by the inspectorate. Ten portable latrines and accessories were erected in five groups of two each to the south of the tents of Government ministries.

Arrangements were made with the Cairo Sewage Transport Company for the emptying of pails, two carts being constantly employed for this purpose. The cleanliness of the latrines was secured by the employment of five of the Sewage Transport Company's men, one to each group of two latrines. In addition to sweeping, &c., lime and cyllin were employed. In the absence of these or some similar arrangements, the surroundings would have become unutterably foul.

The supervision was performed by the inspector of Vidange and two of his subordinates.

Paving of the Narrow Streets in the Native Quarters.

A measure likely to prove of great value to public health is in course of being carried out in the smaller streets of the native quarters. This consists in the paving of these streets with cubical stone sets, 25 by 25 by 20 cm. These stone sets are placed upon a clean sand foundation, the cracks between the stone soon become filled in and an impermeable surface is produced. This impermeable surface, which can be swept and washed and thus kept clean, presents a vast improvement over the old mud surface, absorbent of dirty liquids often impregnated with animal matters subject to decomposition.

An improvement in the health of the inhabitants of the quarters so dealt with may be hoped for, especially with regard to diarrhoeal and other intestinal diseases. This is an exceedingly important matter in view of the high death-rate from infantile diarrhoea.

It is to be hoped that this work will be continued without interruption, as the cost is comparatively small and the sanitary advantages resulting therefrom are undoubtedly great.

Colonial Medical Reports.—No. 148.—Agra and Oudh.

ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH OF THE UNITED PROVINCES OF AGRA AND OUDH, C. L. DUNN, D.P.H., LIEUT.-COLONEL, I.M.S., FOR THE YEAR ENDING DECEMBER 31, 1921, AND THE REPORT OF THE SUPERINTENDING ENGINEER, PUBLIC HEALTH DEPARTMENT, G. McC. HOEY, FOR THE YEAR ENDING MARCH 31, 1922.

VITAL STATISTICS.

THE actual census enumeration of 1921 is taken as the basis of the statistical data of the year under report. The total population of the Province, excluding that of the Native States of Rampur, Tehri-arwal and Benares, was 45,375,787 and on this birth- and death-rates have been calculated. This population is less than the 1911 census figure asvised owing to territorial changes. The superintendent of census operations attributes the decrease in population since 1911 entirely to the influenza epidemic of 1918.

The total number of births registered in the province during the year under report was 1,560,602 against 1,664,192 in 1920.

The number of males born to every 100 of females was 110.68 in 1921 as compared with 110.10 in 1920—practically the same.

An excess of births over deaths was recorded in thirty municipalities.

The total number of recorded deaths during the year under report was 1,795,445 of which 952,243 were males and 843,202 females.

From a comparison of the figures for the last decade with that of the year under review, it is noticed that the infantile mortality in 1921 was lower than that of 1911, 1918, 1919 and the previous decennial average (1901-1910). The total number of deaths under one year was 369,131 against 366,537 in 1920, showing an increase of 2,594 deaths, which is in accordance with the increase in the general mortality.

The usual ordinary measures were taken to reduce the infantile mortality in 1921.

Child Welfare.—Major Mearns and Dr. Sousa, Assistant Directors of Public Health, while on leave in England attended, under the orders of Government, the Conference on the Welfare of Infancy held in London in July, 1921.

The question of establishing a provincial branch of the Lady Chelmsford League for Maternity and Child Welfare in this Province and of affecting a speedy affiliation to the Central Association is under the consideration of Government and a committee has been formed.

The infant mortality rate for the districts during the year under report was higher than that of the preceding year. Classified according to sex the

mortality among male infants was higher (240.56) than that among females (232.07).

According to class the death-rate in order of low mortality was for Christians 6.55, "Other classes," 7.38, Hindus 39.82 and Mohammedans 40.52, the corresponding rates for the preceding year being 5.81, 9.91, 37.62 and 36.71 respectively. Unlike three previous years, this year's mortality amongst Mohammedans in proportion to the Mohammedan population was a bit higher than that amongst Hindus, being in both cases above the provincial average (39.57).

With the decline in the number of births during the year under report still-births fell from 24,626 in 1920 to 21,577 in 1921.

During the year under review altogether 8,814 deaths were verified. Of these, 1,269 were due to pneumonia, 896 to cholera, 637 to dysentery, 616 to tubercle of the lung, 520 to malaria, 491 to influenza, and 235 to all other infective diseases. Casualties due to enteric fever, plague, pyrexia of uncertain origin, other tubercular diseases and tetanus varied between 150 to 200, while those due to relapsing fever, smallpox, kala-azar, leprosy, rheumatic fever and rheumatism, syphilis and gonorrhoea between 5 and 80. Only one death was attributed to scurvy and four to beriberi.

In 1921, as compared with 1920, there is a decrease under the heads of smallpox, fever, and respiratory diseases, while the death-rate from plague was the same. Cholera shows a large increase of 3.15.

In dealing with the outbreak of cholera the department was greatly handicapped owing to the shortage of permanganate of potash. This was chiefly due to the fact that consignments ordered were greatly delayed owing to the disastrous coal strike in England which held up the majority of the shipping, so that the normal supply of permanganate required for combating cholera in districts was not received until the middle of August. As soon as these new supplies had been distributed to the districts, the epidemic was quickly brought under control and came to an end. In connection with this cholera outbreak there was one peculiarity. Cholera outbreaks in the United Provinces have almost invariably commenced during the months of March and April and have reached their greatest intensity in the months of May and June, usually dying away altogether shortly after

the onset of the monsoon. In 1921, the epidemic appeared to be taking the usual course, but was far more severe than usual, owing to the absence of permanganate to keep the well water of villages sterilized. At the end of June a general diminution was very distinctly noticeable. Early in July, a virulent recrudescence took place in certain districts. It was brought to my notice by my staff and by civil surgeons that these recrudescences showed certain radical differences from true cholera in a great many cases and a reasonable doubt arose from these reports as to whether the whole of the death-rate was due to cholera or not. Investigations were instituted in several districts and in the Medical College, Lucknow, with the result that I consider it fairly clearly established that more than 50 per cent. of these recrudescences could not be attributed to cholera, but that the disease which was causing this enormous morbidity and mortality was a virulent type of paratyphoid B. fever. This disease was practically unknown in India before the war, but was prevalent during the latter part of the war in Mesopotamia and much evidence of its introduction into India by returning soldiers has been produced. Many cases occurred among Europeans and Indians which were diagnosed by bacteriological methods. This fever is spread in the same manner as cholera by introduction into unprotected water supplies as wells, by flies and personal contact, consequently the methods used to counteract its spread were exactly similar to those used in cholera, with the result that the epidemic was brought under control, when large quantities of permanganate were available. Revenue officials, vaccinators, and travelling dispensaries well equipped with requisite medicines and disinfectants were concentrated in the infected areas. With the distribution of permanganate of potash, cholera pills and leaflets on a broad scale and the removal of patients to the infectious diseases hospitals, the epidemic practically came to an end early in October.

During the year under report, nine towns out of eighty-seven having a population of 10,000 and upwards did not report any death from cholera and in ten the number reported did not exceed ten.

In urban areas the provincial death-rate from cholera was 2.61 and that in rural tracts 3.35 as against '23 and '14, respectively, in the preceding year.

The total mortality recorded in 1921 from small-pox was 1,439. The death-rate per mille of the population was .03, which is very satisfactory.

Altogether 233 deaths were recorded in towns having a population of 10,000 and upwards.

The urban death-rate from small-pox in 1921 was .08, and the rural .03, against .27 and .13 respectively in 1920.

The work of the plague (or the epidemiology branch) has now been thoroughly reorganized, and the travelling dispensaries have lately had their activities greatly increased.

Evacuation continued to be a popular anti-plague measure, and was resorted to voluntarily in most of the infected districts.

The anti-rat campaign, which is being carried on

systematically since 1917, was extended during the year.

Plague caused 24,009 deaths against 24,872 in 1920.

The annual plague mortality curve reached its maximum in March and minimum in July.

Seventy-three out of eighty-seven towns having a population of 10,000 and upwards did not return any death from plague, and in twelve the number of deaths did not exceed ten.

The recorded decrease is stated to be due to the special health officers being engaged on the anti-rat campaign and the employment of six travelling dispensaries on Sarda canal duty. Only eight deaths were reported to have occurred amongst the inoculated.

Thirteen lakhs, sixty-one thousand nine hundred and twenty deaths were recorded as due to fevers. The death-rate was 30.01 against 30.82 in 1920.

October was the unhealthiest month in respect of mortality from fever. The lowest mortality from this cause was recorded in August.

The urban death-rate from fever in 1921 was 23.43 and the rural 30.48 against 23.21 and 31.21, respectively, in the preceding year.

Sarda Canal Project.—During the early months of the year the staff of the malaria branch was located at Banbassa, the head works of the Sarda Canal. A permanent gang of twenty-five men, under the supervision and direction of the Assistant to the Director of Malarology, were employed solely on anti-malarial work. Much of the work of the malarial branch was devoted to the eradication of mosquito breeding grounds. Irrigation channels were cleared of grass and weeds, irregular and sluggish streams in the river bed were made to flow in narrow and deepened channels, and stagnant pools were filled up, or if too large were regularly oiled. Quinine was administered as a prophylactic in April to all labourers, and the result of this measure was very satisfactory. A camp laboratory was opened in a large swiss cottage tent, and very valuable work in the examination of blood slides was done there, but towards the end of December the room in the hospital building, especially constructed for the laboratory, having been completed, was occupied. The spirilla of relapsing fever were found in one case of fever in a Pathan labourer in this way and prompt sanitary measures were taken to check the disease which were entirely satisfactory. Adult mosquitoes were caught in tents and huts, examined and classified, and a large number dissected. Larvæ were collected from the various breeding grounds and were hatched out and identified. The effect of all this was that work on the canal was rendered possible until the advent of rains.

Early in November the work on the Sarda Canal was resumed. The head works at Banbassa being the most unhealthy portion of the canal works, the malarial branch has been located there during the working season on the canal. All labourers employed on head works were given prophylactic quinine during November and early in December. As a result of mosquito dissection it was ascertained that they were not infected, and prophylaxis was stopped.

Colonial Medical Reports.—No. 148.—Agra and Oudh (contd.).

Anti-malarial Schemes.—It is very striking that in those places where the recommendations of previous reports have been attended to and are nearing completion, the epidemicity of malaria has been greatly reduced. The results in Meerut are excellent, and success of a more modified kind has been obtained in Nagina and Saharanpur. It is striking that only in Kosi, of all those places, has malaria ever been epidemic since the greater part of work was completed. In Kosi this is explained, as the chief recommendation of the Special Malaria Officer, viz., lowering the bed of the canal, has not yet been carried out. This measure has now been sanctioned, and it will be carried out in the near future.

Distribution of Quinine.—Two hundred and nine pounds of quinine was issued for free distribution for curative purposes to the districts which were badly infected with malaria.

During the year influenza was prevalent to a greater or less extent in twenty-six districts of the province. The outbreaks were ordinarily of a mild type and short-lived. In some districts only sporadic cases were reported to have occurred.

The total number of deaths from dysentery and diarrhoea in 1921 amounted to 17,301, as against 15,873 in 1920, indicating an increase of 1,428. September returned the highest mortality and February the lowest.

Out of eighty-seven towns, having a population of 10,000 and upwards, two towns returned no deaths, while the number of deaths in twelve did not exceed ten.

Deaths under respiratory diseases numbered 30,317 (5,567 from pneumonia, 4,773 from phthisis, and 19,977 from other respiratory diseases), against 33,198 in the preceding year. The highest mortality from these causes was recorded in January and the lowest in July.

Out of eighty-seven towns, six did not return any death from respiratory disease, and in nine the number of deaths did not exceed ten.

The urban death ratio was 7·18 and the rural 21, as compared with 6·75 and 28, respectively, in the preceding year.

These constant excesses in urban over rural area mortality under the heads "dysentery and diarrhoea" and "respiratory diseases" may be ascribed partly to greater accuracy in registering cause of death and overcrowding in towns, but in my opinion it is mainly due to the bad state of roads in large cities, resulting in a grave and increasing nuisance from dust.

This state of affairs is indeed deplorable. Every one will admit that owing to heavy motor traffic in recent years in our big cities the dust nuisance has greatly increased and needs earnest attention. I have been drawing the attention of important municipal boards to this matter in my inspection reports and otherwise, and suggesting the necessity of replacing water-bound macadam roads by tar macadam or tar surfaced roads in order to get rid of the increasing dust nuisance, which is responsible for a large in-

crease in respiratory and intestinal diseases. The capital cost of tarred roads is no doubt heavier than that of the existing roads, but the eventual cost over a period of years would be considerably less.

Deaths from injuries totalled 23,263; deaths from suicide numbered 2,361 (682 male and 1,679 female); wounds and accidents were responsible for 15,373 deaths; 5,222 deaths were caused by snakes and wild beasts; deaths from rabies numbered 307.

A note regarding the causation and prevention of the hookworm disease was drawn up by me and copies thereof supplied to all district magistrates for circulation to all the large employers of labour in their districts. The note was also translated into the vernaculars and copies circulated through travelling dispensaries.

GENERAL REMARKS.

A brief note on the provincial meteorological and weather conditions in these Provinces during the year under review, kindly furnished by the Director-General of Observatories, Simla, is appended below:—

The Cold Weather Period, January and February.—More than twice the normal amount was received in January, owing mainly to the heavy rainfall in connection with a winter depression in the third week of the month. There was very little rain in February. Humidity and cloud proportion were in defect; temperature was slightly above normal.

The Hot Weather Period, March to May.—Rainfall was in large defect in March. But April fared better; rainfall was in excess by 10 per cent. in the east of the Province and in defect by 48 per cent. in the west. In May there was little or no rain. There was much less cloud than usual, and humidity was generally in defect. Temperature was above normal by more than 3° in March and April and by 5° in May.

The Monsoon Period, June to September.—The monsoon extended feebly into the Province on June 12 and was effectively established on the 18th. From that date to the 23rd there was widespread rain, and the total rainfall of the month was above normal. A break that set in on June 25 persisted till July 8 and the total rainfall of July was about four inches in defect. The monsoon was fairly active throughout August and September, and the rainfall of these two months was well above normal.

Cloud proportion was normal in June, and in defect in July; it was in excess in the other months. Humidity was in slight defect and temperature above normal in July; in the other months they were roughly normal.

The United Provinces West had its normal fall in October, but the United Provinces East had only 10 per cent. of the usual amount. The month of November was dry, while the rainfall in December was in large defect. Skies were less clouded than usual, except in December; temperature was above normal in this month.

The Hygiene Publicity Bureau intends that all health officers and all the officers in charge of travelling dispensaries should lecture in towns and

villages on twenty public health subjects by the aid of lantern demonstrations and carry on their propaganda by the aid of coloured posters and demonstrations of the causes and effects of diseases.

Seven subjects (cholera, plague, malaria, tuberculosis, smallpox, child welfare, and flies) have been taken up and twenty-five sets of slides on each subject have been prepared and stories and lessons in simple language to illustrate the pictures have been written. Fifteen medical officers of travelling dispensaries have been trained in lecturing work.

In addition cinematograph films on public health subjects are being shown and others are in the course of preparation. The experience gathered of this scheme up to date is that this method of propaganda is extremely popular. Enormous crowds have been attending the demonstrations held up to date. I am convinced that by propaganda of this type at large fairs and in villages and towns, a general knowledge of hygiene in the interior of districts is much more likely to be spread than by the old methods of distributing leaflets which were never read.

The travelling dispensaries will now be chiefly used for propaganda work and the prevention of endemic and epidemic disease. They will also continue the treatment of all cases brought to their notice during their tours.

Waterworks—General.—The outstanding features of municipal supplies are the failures of the Boards to exercise control over their distribution and check waste, to adjust taxation to meet added running charges, and the starving of works as regards funds for repairs and improvements. Frequent applications to Government for grants-in-aid are made to cover items rightly debitable to maintenance. Appeals to Government for help have been generously met hitherto, which course apparently inculcates a reliance on grants-in-aid to meet deficits.

Water meters are not provided in sufficient number, nor are those meters which have been installed kept in proper repair. Extensions of the distribution and private connections are granted without thought of their effect on the system, and the Boards do not realize the necessity for keeping accurate records of their supply system.

There are systems in operation where some areas receive a supply of over 100 gallons per head per diem of the population served, while other areas receive practically no water at all.

There is no municipal water supply in these provinces which could not easily be made self-supporting if reasonable care was exercised in its management.

In cases where Boards constantly fail to maintain their supply, a possible solution of the difficulty might be to hand the system over to a private company on equitable terms, assuring the public of an efficient supply.

The question of regular and satisfactory supply of coal still causes anxiety and many Boards judge the suitability of their coal by the price and not by its calorific value. A tendency has also been noticed for Boards to use coal supplied for water supply

pumping, for brick and lime burning. Cases have come to notice where no credit for coal used in this way has been made to the water supply.

The suggestion made in a previous year that Boards should combine in the matter of coal supply contracts has not met with any response.

Shortage of water supply is reported from all municipalities and the fact that the supplies are being run at a loss in most instances renders extension of the water supply a difficult proposition. No municipality is entitled to sympathy until it seriously tackles the question of waste, and increases its taxation to cover running expenses. Such economies are intimately bound up with any steps for improvements and extensions.

Water Analyses.—Periodical analyses of water supplied by the various open waterworks show that the supply was of uniformly good quality except at Allahabad, where over 55 per cent. of the total number of samples tested failed to come up to the required standard.

Drainage—General.—Local authorities as a rule devote very little money to drainage improvements, all the larger works being financed by grants-in-aid by Government.

Where sewers exist the number of house connections is surprisingly small. The public in the large towns have not commenced to realize the benefits of a water-borne system of sewerage. Extensive use is made of pail depots to save cartage of night-soil, and many instances have come to light where pail depots and even manholes are used to dispose of street sweepings and rubbish. This practice is persisted in, in some cases, although frequent blockage of sewers takes place and even though it entails great expense and inconvenience in cleaning sewers.

The sewage pumping stations at Allahabad and Cawnpore have been kept running fairly efficiently, but at Allahabad no attempt has been made to derive full benefit from the sewage pumped. At certain seasons the sewage is allowed to overflow from the farm and cause a nuisance in the river.

At Allahabad also owing to failure to maintain the motors for the sludging gear in order, the sumps were filled up with solids causing a stoppage of pumping and a great nuisance to the public by the overflow of sewage. This trouble has now been rectified by the Municipal Board.

The life of a workman was lost at Lucknow owing to asphyxiation from sewer gas and great difficulty is experienced at this pumping station owing to the huge quantities of solids brought down. This is owing to the use of manholes by sweepers as a dumping place for rubbish and street sweepings.

The Municipal Boards generally show little tendency to recognize the necessity for employing competent engineer staff. They are loath to increase taxation to meet the capital charges for necessary public works and rely on receiving grants-in-aid from Government towards almost every work they undertake.

They also rely on this branch to carry out their

construction for them and when they encounter trouble in maintenance owing to lack of skilled supervision, they are not slow to place the blame on his department. The tendency is to force this department not only to accept responsibility for technical advice and construction, but also for maintenance. It is possible that technical advice and financial help has been given too freely in the past and the time has perhaps come when a halt should be called to grants-in-aid and when pressure should be brought to bear on Boards to employ

engineers properly qualified to undertake maintenance, prepare projects and to carry out construction.

A tendency has been noticed during the past year for some Boards to encourage private enterprise in the matter of electricity supply. The time has also come when the question of permitting private companies to undertake public water supplies should be considered and a Waterworks Act drafted. This course would relieve Government of a considerable amount of responsibility and also benefit the public by a more efficient water supply.

Colonial Medical Reports.—No. 149.—Ceylon.

CEYLON MEDICAL REPORT, BY G. J. RUTHERFORD, PRINCIPAL CIVIL MEDICAL OFFICER AND INSPECTOR-GENERAL OF HOSPITALS FOR THE YEAR 1921.

ACCORDING to the Census taken on March 18, 1921, the total population of Ceylon, inclusive of immigrant coolies (but exclusive of military and shipping), was 4,497,686 (of these, 8,421 were Europeans). This total population is an increase of 391,336 over the figures of the previous Census taken in 1911.

Vital Statistics.—183,920 births were registered, which is equivalent to an annual rate of 40·5 per 1,000 of the population, as compared with 163,720 births and an annual rate of 34·06 in 1920.

The deaths registered in 1921 amounted to 140,749, as compared with 132,955 in 1920, which is equivalent to an annual rate of 31 per 1,000, as compared with an annual rate of 27·66 in 1920.

In England and Wales during 1921 the birth-rate was 22·4 per 1,000, and the death-rate 12·1 per 1,000.

The infant mortality, i.e., the deaths of children under 1 year of age, per 1,000 births during the year is looked upon by sanitarians as affording the most important index as to the general sanitary conditions, and the continued high rate in Ceylon is a proof of the slow progress made in sanitary improvement in the island generally. In the thirty-three principal towns the infantile mortality during the year was at the rate of 238 per 1,000 births. In England and Wales in 1921 the rate was 83 per 1,000 births, and in ninety-six of the great towns in England was 87 per 1,000 births.

Some effort to effect an improvement in this condition was made by increasing the facilities for training midwives, and appointing more of them to Government institutions and encouraging their employment on estate hospitals. A crèche was started in Colombo by the efforts of certain ladies, and an antenatal clinic was started at the Lying-in

Home to give advice to expectant mothers. Real progress in the reduction of infantile mortality depends mainly on the possibility of education creating a belief in modern hygienic principles amongst the mass of the population. It is said by local medical men that there is an increasing tendency to a reduction in the breast-feeding of infants amongst the indigenous population, and this is to be deplored.

The mean birth-rate on estates was 40·29 per 1,000, and the mean death-rate was 32·14. The principal causes of death on estates were given as under: Debility, anchylostomiasis, pneumonia, dysentery, diarrhoea, infantile convulsions, phthisis, dropsy, anæmia, and other diseases.

Influenza was still prevalent in most parts of the island, but was mild and the mortality less.

Malaria was very prevalent over the greater part of the island, and there was a marked increase both in hospital admissions and dispensary cases. The increase in the number of cases was general, except in the Eastern and Northern Provinces, where the year's rainfall was normal or above the average, whereas in other Provinces the deficient rainfall was associated with a marked increase of the prevalence of the disease. The deficient rainfall in most parts was evidently favourable to the multiplication of the malarial mosquito. During the last few weeks of the year one species of malaria-carrying mosquito (*Anopheles listoni*) was found for the first time to be present within the municipal limits of Colombo, and cases of malaria occurred where the infection was undoubtedly contracted in the city itself. The question of malaria control generally is under serious consideration, and the necessary first steps were taken in 1921 by the appointment of an entomologist (Mr. H. F. Carter)

from England to investigate problems concerned with the identification, habits and breeding places of malaria-carrying mosquitoes, &c. Mr. Carter took up duty at the end of May. Some 248 schools were visited, and splenic enlargement was found in 8 per cent. of cases. In addition, a spleen census was taken in certain villages, and splenic enlargement was found in 30 per cent. Over 2,000 casual blood examinations of cases not suffering from fever, but taken at random, showed the presence of malarial parasites in 150 cases. In a very large proportion of these cases the simple (or benign) tertian parasite was the only form present.

Plague.—The total number of cases reported was 187 with 171 deaths. Of these 187 cases, 184 occurred in Colombo, of which 145 occurred in the first quarter of the year.

Smallpox.—Only eighteen cases were reported, as against 126 cases in 1920. Of the eighteen cases, twelve occurred in Colombo, of which eleven occurred early in the year, as part of the infection that had been imported from India in 1920. The other case occurred in April in an arrival from India also. Two cases in the Northern Province and one case in the Southern Province were also amongst recent arrivals from India.

Vaccination.—The total number of primary vaccinations performed was 127,102; of these, 119,766 were successful, and in 6,186 cases the results were not determined. The percentage of successful primary vaccinations was 94.2 per cent. Seed lymph for the vaccination of calves was obtained from the Lister Institute of Preventive Medicine, London, and from the King Institute, Madras. A certain amount was also prepared locally.

Enteric.—Some 942 cases, with 242 deaths, were treated in the various hospitals in 1921, as against 1,077 cases, with 280 deaths, in 1920. The Registrar-General's return for the whole island shows 668 fatal cases, as against 871 in 1920.

Dysentery was apparently as prevalent in 1921 as in the previous year judging from hospital cases. The Registrar-General's returns give 4,255 fatal cases of this disease, which points to continued pollution of water supplies in many parts of the island.

Leprosy.—The report of the medical officer in charge of the Leper Asylum at Hendala gives the following particulars as regards 1921:—

	Males	Females
Remained on December 31, 1920	388	97
Admitted	91	18
Discharged	28	3
Died	44	14
Remained on December 31, 1921	407	98

Of the 109 admissions, ninety-four were new cases, and the type of disease was as follows: Tubercular, 20; anæsthetic, 51; mixed, 23. Of the "discharges," two were granted home isolation, two were repatriated to India, one to China, two as being free from symptoms, whilst twenty-four

absconded, of whom seventeen were brought back by the police.

At Kaluunai, and later in the year at the new Mantivu asylum, seventy-two lepers were treated, of whom nineteen were new cases. At the end of the year the new asylum at Mantivu island, Eastern Province, was opened, and the patients transferred there from Kaluunai.

During the year thirty-two cases were treated with injections of the ethyl esters of the oil of *Hydnocarpus wightiana*, as recommended by experts in Hawaii and in India. It is too early to express any definite opinion on the results of this treatment, but in some cases there has been decided improvement. Further trials are being carried out.

Anchylostomiasis.—Owing to the almost universal infection of all hospital cases with the parasite of this disease, a large number of cases—whilst recognized in treatment—are entered on the registers under the heading of Other Diseases.

The following is an abstract of the report received from Dr. W. P. Jacobs of the Rockefeller Foundation, showing the progress and activity in anchylostomiasis operations during 1921:—

During the year campaigns were conducted only in the Western Province. The towns and villages in the Henaratgoda-Minuwangoda-Veyangoda sections and the towns and villages in the Kalutara and Panadura sections furnished the fields of operation. In addition, special work was undertaken at six jails, four in the Western Province, one in the Southern Province, and one in the Central Province. During the year 81,946 villagers and school children offered themselves for treatment at the various dispensary points, and to them were given 185,098 doses of vermifuge, an average of 2.26 treatments per person. In the jails 2,671 persons were given 5,033 doses of medicine. (In addition to these figures, sixty-six estates report that they carried on the work independently, and treated 7,308 labourers during the year; and in 250 Government hospitals and dispensaries 25,284 people were given 47,161 doses of hookworm medicine. This makes a grand total of 117,209 persons treated during the year.) The personnel needed to carry on the campaign work consisted of four directors, four assistant directors, and a subordinate staff of sixty-seven, of whom forty-six were employed continuously. One of these units was dis continued in July as a matter of economy, and one assistant director was transferred to other work in October. With a reduced staff, the amount of work accomplished during the year compares very favourably with the amount accomplished in previous years of estates, except in 1920, when the staff used was considerably augmented over that of previous years and over that of this year.

While the best results were not obtained from the campaigns, due to a lack of sanitation in the district selected, with consequent reinfection, yet the campaign have been of material advantage in stimulating thought and action in public health matters. For example:—

(a) The greatest stimulus to latrine construction directly and indirectly, has been in association with campaign areas.

(b) Valuable educational work has been done, by means of lectures, demonstrations and treatments, to village and to schools.

(c) A considerable reduction in the mass of infection has resulted from the very large number of treatments given since 1917 (over 800,000).

(d) Many people have been relieved of all symptoms.

(e) Many have been cured who would have died if treatment had not been given.

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Methods of reaching the People.—It was learned in the preliminary work of 1920 that the people could be reached most successfully through the headmen and through the schools.

Headmen.—The assistance of the headmen was enlisted through the Government Agent, who by means of circular letters, personal visits, and lectures instructed them to co-operate. The headman's influence in the village is great, and the amount of co-operation obtained from the people is in direct proportion to the interest taken by the headmen. A large majority of them did excellent work, and were properly rewarded therefor.

At the suggestion of the Government Agent, and with the co-operation of the Government printer, a certificate of merit was prepared to be given to those headmen who persuaded 90 per cent. of their people to be treated. This certificate has proven of much value, and is greatly admired and desired by headmen. The holding of the certificate brings forward also a strong claim for the monetary reward which Government has promised the headmen who are most successful in this work. Many certificates have already been awarded.

Schools.—In enlisting the help of Government schools, the schoolmasters were circularized by the Director of Education; in getting the co-operation of the private and semi-private schools, help was had from the various managers of these institutions. These officials pointed out in their circulars the advantages of treatment, and advised the teachers to be treated themselves and get their pupils treated. With very few exceptions the schools have responded satisfactorily in every way.

In addition to the above agencies, the general public was brought to learn about the disease and about the campaign in other ways. In August a floral pageant was held at Henaratgoda. The Field Director took advantage of this occasion, and not only decorated his office, but added signs and posters to attract people to the office. An attempt was made to tabulate the number of those visiting the office to see pictures and parasites and to have the work explained, but the crowds became so large that it was not possible to do so. The Field Director estimated that at least a thousand people came to his office during the day.

The same sort of educational work was done in the Pasdun korale. An agri-horticultural show was held on June 26. The Director in the Kalutara district arranged a special dispensary display at this show. Large crowds of villagers and estate labourers visited the dispensary, and afterwards large numbers came to the dispensary which was located in that section and were treated.

The vedarala is very influential in the village community. He did not co-operate at first. Late in the year, however, his aid was enlisted by allowing him to prescribe for and treat patients from his villages under the supervision of the Field Director. As a result of this procedure active opposition from most of the vedaralas ceased.

In order to make the dispensaries attractive to visitors, interesting features of the work were brought to their attention. Parasites of various kinds, in addition to hookworms, were collected, properly labelled, and displayed. Pictures of school groups and village groups of infected cases and of cured cases occurring in the immediate neighbourhood were mounted, labelled, and exhibited for the information of the public. In addition, the medicine used was shown, the eggs and larvæ were demonstrated under the microscope. All of the factors helped to break down the prejudice which exists here as it does in other countries.

Treatment Methods.—Treatment methods used during 1921 did not differ from those of previous years, except in the dosage prescribed, which was reduced for campaign reasons. This reduction was due to the fact that in village work supervision could not be so well maintained, as patients went to their homes after taking the dose of

salts, and could not be kept under observation until the salts acted. 185,098 doses of oil of chenopodium were given in this way to villagers. They did not object to the medicine, but, on the other hand, seemed to like its pungent taste and smell. Very rarely were there ill-effects. This experience has done more than anything else to allay the fear that villagers had of the medicine.

Hospital and Dispensary Treatments.—The number of people reached by the regular campaigns has heretofore been a very small percentage of the total population of the Colony. Inasmuch as a large majority of the people are infected with the disease, it is very necessary to make treatments available to a greater number. With this end in view, a circular was sent by the Medical Department in August to all hospitals and to all dispensaries asking them to give special attention to this matter. As a result, during last year at 259 hospitals and dispensaries throughout the Colony 47,161 doses of medicine were given to 25,284 people. The development of this feature of the work will be given special attention in the future, and should prove one of the most potent means of relieving a large mass of the people of the ordinary complaints from which they suffer by reason of infection with hookworms.

Treatment by Estates.—Although no regular campaigns were undertaken on estates in 1921, still a number of superintendents realizing the advantages of treatment continued to give chenopodium to their labourers. Sixty-six estates report 7,308 labourers treated during the year. While the number mentioned is small, it is an indication that many superintendents are keeping the subject in mind, and fully appreciate the value of giving the medicine in proper doses. This procedure should be given careful consideration by all estates. In order to stimulate treatments of this kind, Government is prepared to furnish to estates which pass the sanitation test of the Inspecting Medical Officer free drugs for hookworm treatment. Where an estate has a dispenser regularly employed, this dispenser can, in addition to his regular duties, treat the labour force within a given time during periods of slackness. The Ancylostomiasis Laboratory in Colombo is prepared to make any necessary microscopical examinations which are desired. Specimens can be securely packed and forwarded to the laboratory by post.

Post-campaign Work.—No post-campaign work was done during the year. As mentioned in the report for last year, post-campaign work was planned to begin at the Dikoya district in September, 1920. As the inauguration of this work coincided with the depression of the tea and rubber markets the attempt was abandoned. Since that time, however, tea has recovered all of its former popularity and prosperity. The objections offered then could not be offered now. Post-campaign work is very desirable, and is the only means yet devised for following up work which has already been done. This work should be undertaken with a large staff at the earliest possible moment.

Central Laboratory.—Field laboratories for making faecal examinations of persons before and after treatment were discontinued in April, and a central laboratory was established in Colombo in May to serve all field units. This change had been under consideration for some time. Enough work had already been done with the microscope in Ceylon to determine that more than 95 per cent. of estate labourers and villagers are infected with the disease. In view of this fact the cost of maintaining expensive field laboratories, to determine infections was not justified, as practically everyone is infected. It has been shown by experienced investigators that two full treatments with the oil of chenopodium will remove from 95 to 97 per cent. of the worms from each individual. Persistence in treatment to remove the few remaining worms and to obtain microscopical cures is therefore not economical. Since preliminary and post-examinations constituted all the work of the field laboratories, it was decided for the above reasons to abolish them. It is also true that the lack of sanitary arrangements in the villages makes re-infection certain and rapid. Under these circum-

stances, "microscopical cures" are misleading to the patient. Finally, all "field units" were located in easy postal communication with Colombo, and faecal specimens could be forwarded quickly and easily.

The central laboratory in Colombo has justified its existence. Two microscopists have been able to examine all specimens submitted during the year—8,982. The economical saving of this procedure will be seen when it is known that each field unit employed from three to four microscopists, and during a large part of the year four units were in operation.

Sanitation.—As in most other countries, sanitation in Ceylon has not kept progress with treatment campaigns. The Sanitary Department has a comparatively small force of inspectors, and, as their work naturally requires more time than the treatment work, it is not possible for them to keep up with the campaigns. In the Minuwangoda-Veyangoda-Ilenaratgoda district a great deal of preliminary work was done in the matter of getting latrines built, but even here a large percentage of the houses was found upon inspection to be unprovided with latrines, or that the latrines were not used. At many of the schools in this district there were no latrines of any kind. These remarks apply with greater force to the situation in the Kalutara district and in the Panadura district, where there were even fewer sanitary inspectors. As a result of the lack of sanitary precautions in the various areas of operations, it can be stated that the anchylostomiasis work has been of only transitory value, except in the educational work which was done.

The present force of sanitary inspectors can get latrines constructed. They are not able, however, on account of insufficient numbers, to get latrines constructed and also used, which is of greater importance. The villager is reluctant to use the latrines which he himself has provided, especially if there is some undergrowth near by to which he may resort. If, however, steady pressure by frequent inspection is brought to bear on him, he will eventually begin to use the latrine and continue to use it. Until the number of inspectors is increased the use of latrines will continue to be neglected. Since an enormous number of the people in Ceylon are infected with hookworm disease, and since the death-rate from diseases which are contracted, directly and indirectly, from polluted soil is very high, the question of having competent inspectors in sufficient numbers to control soil pollution is most important. It should be stated that without proper sanitation no permanent good will come from treatment alone.

A most important step was taken by the Sanitary Department when it inaugurated a series of lectures to be given to headmen in the triangular area. When the headmen, so instructed, have passed a given examination and have demonstrated that they are competent in village sanitary matters, Government has agreed to pay them for the services rendered in this respect. Vedaralas have been asked to attend these lectures also. This is most important, as the majority of people in the villages call in the vedarala when they are ill, and if it is possible to let him acquire useful sanitary information, as well as useful knowledge in treatment, the villager will be benefited accordingly.

Sanitation on Estates. As no work was done on estates during 1921, it is difficult to say just what the sanitary situation is at present. Hints dropped here and there would indicate that the question of sanitation has been neglected for the most part. A report from one Province in which the most work was done intimates that 70 per cent. of the estates have not kept up their latrines. This is discouraging news, in view of the fact that anchylostomiasis operations have been conducted on approximately 1,700 estates in Ceylon, and that over one-half of the total labouring population has already been treated. Proper attention to sanitation in the beginning would have furnished excellent results, as, during the time the campaigns were in progress on estates, tea and rubber were commanding excellent prices. Until estates show visible and active interest in sanitation, it may be in-

advisable to undertake any further anchylostomiasis work among the labourers.

Jail Work.—A special feature of the work during 1921 was that done in jails. This work was undertaken at my request, and the prisoners at Welikada, Mahara, Hulftsdorp, Negombo, Galle and Kandy were treated. The percentage of infection in jails was very high (90 to 95), but the infection usually was light, and very few prisoners complained of symptoms. In all 2,671 prisoners were given 5,633 doses of medicine.

Official and other Support.—Hearty support has been rendered at all times by officials. The work could not have been carried on in the Western Province without the assistance of the Government Agent, who gave freely of his time and energy. The Assistant Government Agent, Colombo district, was most helpful. He visited the areas in person, and as a demonstration he took the medicine himself. The many suggestions which came from these officers made it possible to carry on the work in a progressive manner. The Assistant Government Agent, Kalutara, also gave valuable assistance to the directors of the campaign in his district. Mudaliyars, police magistrates, and other influential people were of great assistance.

The Acting Director of Education was always interested in the progress of the campaigns made in schools, and his instructions to schoolmasters made this part of the work possible. He was also instrumental in getting many additional latrines erected at schools.

The Sanitation Department furnished lecturers and inspectors in the areas of operation, and this gave a great stimulus to the building of latrines in these districts. In the whole of the Western Province 20,661 were built during the year, many of them in connection with the anchylostomiasis campaigns.

The facilities of the Medical Department were always placed at the disposal of the campaign officers, and this made it possible for the work to go on smoothly.

Parangi (Frambesia, or Yaws).—The number of hospital admissions was 8,161.

Apart from hospital admissions a large number was treated at the various dispensaries throughout the island. Public attention has been drawn to the wide prevalence of this disease in Ceylon, and to the remarkable efficiency of modern methods of treatment by salvarsan (and its homologues). Government recently appointed a Commission, under the chairmanship of the Principal Civil Medical Officer, to report on the feasibility of an organized campaign to deal with this scourge. During the year a second Itinerating Medical Officer was appointed to seek out and treat patients in their own homes, for the disease is especially prevalent in out-of-the-way villages amongst a population not too keen on admission to hospital. These officers have done good work, and it is gratifying to find that they can report that sufferers gladly avail themselves of their services and appreciate the striking results of modern treatment. One Itinerating Medical Officer in the Galle area (North-Western Province) treated 2,532 cases; the other, who only commenced work late in the year, treated 166 cases in the Province of Uva. A third Itinerating Officer is being appointed to work in the Eastern Province during 1922, and it is hoped to employ others in the near future in other districts where the disease is most prevalent.

In addition to the special treatment given by the Itinerating Medical Officers, most of the hospital cases in the various Provinces received this treatment also. At Dambulla hospital over 1,000 cases

were so treated. Apart from hospital cases, some 51,456 cases received other forms of treatment at the various dispensaries, and this figure gives an idea of the wide prevalence of the disease.

Cancer and Sarcoma.—The number of cases of malignant disease treated in the various hospitals was 395 with sixty-four deaths. The majority of these cases were treated at the General Hospital, Colombo. Many cases, unfortunately, only enter hospital when the disease is in an advanced stage.

Tubercular Disease of the Lungs (Pulmonary Phthisis).—Apart from the cases of phthisis admitted to General Hospital, there are three special institutions dealing with cases of this disease: The Anti-Tuberculosis Institute in Colombo, the sanatorium for early cases at Kandana, and the hospital for advanced cases at Ragama.

At the Institute in Colombo.—The total number of visits paid was 7,317, the number of first attendances being 2,785. Out of these, 1,576 were diagnosed to be cases of phthisis. Of the more advanced cases, 1,061 were recommended for admission to the chronic hospital at Ragama, whilst 216 less advanced cases were advised to go to the sanatorium at Kandana. A series of public lectures on tuberculosis were given at several towns and were well attended. Usually the lectures were illustrated by lantern slides, and often given in the vernacular.

At Kandana Sanatorium (48 Beds).—183 cases were admitted during the year, 101 males and eighty-two females, and forty-two were left over from the previous year, making a total of 225 under treatment. None proved fatal. The average stay of a patient was eighty-one days. In eighty-eight cases the disease was reported to be arrested, and in sixty-seven cases the condition was reported to be much improved on discharge.

Ragama Hospital (for Advanced Cases) (201 Beds).—The hospital has been overcrowded during most of the year, the average daily sick being 225.61. Additional accommodation of six beds for paying cases was provided during the year, and two wards of twenty-six beds each were started, and will be ready for use early in 1922. The total number of cases admitted was 1,003, of whom 182 died.

Port Health Precautions.—During the year 2,338 British and foreign steamers and 265 native sailing craft called at the port of Colombo and were medically inspected. Four vessels were kept in strict quarantine until the sick were landed and disinfection performed. No cases of plague were landed from any ships during the year, although deaths had occurred on two ships before arrival in port. Only two cases of smallpox were landed at Colombo. One case of smallpox amongst the crew of the s.s. *Lady McCallum* was landed at Hambantota, one case of diphtheria was landed from H.M.S. *Caroline*, and six cases of chicken-pox and three of measles were landed from other vessels. Disinfection of 3,849 tally clerks, 52,305 cargo coolies, 25,875 coal coolies, and 61,492 passengers was carried out. Some 1,390 vaccinations were done

during the year, chiefly amongst arrivals from India via Mandapam. A clinic for the treatment of venereal disease amongst seamen was opened at the Port Surgeon's Office in June; forty-nine cases were treated for syphilis alone.

METEOROLOGY.

Rainfall.—The highest rainfall registered this year was at Carney estate near Ratnapura, which had a total of 223.82 in. and 249 days on which rain fell. This station also has the highest annual average rainfall (viz., 215.06 in. on 227 days), and in 1921 differed from the majority of stations on the south-west side of the island in having more rainfall than its average. The lowest rainfall for this year was 30.77 in. in sixty-seven days at Nachchikkali, near Puttalam. The lowest average is 33; 31 in fifty-six days at a station a little further north, Marichchukkaddi, which also recorded the longest period of drought in 1921. The longest wet period occurred at Maliboda, and lasted fifty-six days. The rainfall during the south-west monsoon was distinctly below average, and most stations in the south-western quarter and centre of the island (which rely on that monsoon for a large proportion of their rainfall) were consequently far below their average for the year, deficits of 30 in. being common. The rainfall at Colombo (Cinnamon Gardens) was 53.56 in. in 179 days, or about 25 in below average. At Kandy 73.30 in. were registered in 197 days, while the annual rainfall at Nuwara Eliya was 70.95 in. in 231 days. In the north the totals for the year were about normal, and in the north-east (e.g., Trincomalee) and eastern parts they were well above average, a result largely due to heavy rain in the last few days of the year.

Temperature.—The station showing the highest mean shade temperature for the year was Mannar with 82.9° F., and the lowest Nuwara Eliya with 59.9° F. The figures for Colombo and Kandy were 81.3° F. and 76.6° F. respectively.

The highest shade temperature recorded during the year was 99.8° F. at Anuradhapura on August 24. The highest on record is 103.7° F. at Trincomalee on May 12, 1890. The lowest this year was 28.1° F. at Nuwara Eliya (6,000 ft. above sea-level) on February 25.

The highest shade temperature at Colombo in 1921 was 92.6° F. on February 11.

The mean daily range, i.e., the difference between the mean of the maximum and the mean of the minimum, was highest at Nuwara Eliya (17.8° F.) and lowest at Galle (8.0° F.). At Colombo and Kandy it was 11.9° F. and 15.5° F. respectively.

The absolute range for the year, i.e., the difference between the highest and the lowest readings, actually recorded at any one station, was greatest at Nuwara Eliya (50.5° F.) and lowest at Galle (17.4° F.).

The offsets from average of the mean annual temperatures in 1921 can be roughly summarized as above normal in three-quarters of the island, and

below it in the north-east quadrant. The greatest deviations are only 0.5° F. In the mean wet bulb temperatures the up-country stations are above average and the low-country ones below, the greatest offset being 0.7° F. at Anuradhapura.

The following is the report of the Sanitary Branch of the Medical Department, by Dr. J. F. E. Bridger, Sanitary Commissioner:—

For the purpose of better supervision of Sanitary Inspectors, two of the Senior Sanitary Inspectors were appointed Supervising Sanitary Inspectors in October and December respectively. The former is stationed at Henaragitoda to supervise the Sanitary Inspectors of the triangular area. This is an area mapped out to carry on the work of sanitation in connection with the Anchylostomiasis Campaign. The latter was detailed off to work under the Sanitary Officer, Central Province.

A training class, which was started on December 1, 1920, was continued for six months from that date with thirty students. On May 6 an examination was held, and twenty-four students were successful. Of the twenty-four passed candidates, twenty-one have been appointed to the Department, and one has secured a post under the Local Board of Negombo.

During the year 177,706 premises were inspected, of which 32,740 were found insanitary; 4,197 mosquito-breeding places were detected and dealt with, 2,407 prosecutions were entered in respect of breaches of sanitary rules and regulations. 10,539 notices were served for remedying sanitary defects, in 4,842 of which the requirements were voluntarily complied with, while the others did so under persuasion.

The following infectious diseases were reported, and necessary action on these were taken by the officers of this Department: Enteric, dysentery, chicken-pox, measles, plague, mumps, phthisis.

It is gratifying to note that no serious outbreak of infectious diseases occurred during the year under review, except small outbreaks of dysentery, chicken-pox and enteric, which were reported from various parts of the island, and they were promptly subdued.

Three public latrines of an approved type were constructed at Government expense in the Sanitary Board towns, and three public wells were constructed.

Twenty thousand five hundred and thirty-nine wells were inspected during the year, of which 6,690 were found unprotected from pollution. 409 wells were improved. Eleven samples of water were examined chemically and bacteriologically by the Government analyst and the Director of Bacteriological Institute respectively at the request of this Department. Eight of the samples examined were found unfit, and action has been taken to improve them.

Scavenging of public and domestic refuse was carried out by the Local and Sanitary Boards in the towns declared under Ordinances Nos. 13 of 1898 and 18 of 1892. In many of these towns

scavenging is carried out by contractors. Several complaints have been made by various Sanitary Inspectors about the unsatisfactory way of scavenging, due to want of supervision by the respective contractors. Better results could be obtained if the scavengers are placed under the immediate supervision of the Sanitary Inspector.

Where Inspectors of the Sanitary Branch are stationed, the regulations relating to the licensing of trades were enforced in order to improve existing conditions, but it is regrettable to note that in certain towns outside the Western Province there was no uniformity in their enforcement.

Sixty-seven samples of milk have been analysed by the Government analyst at my request, of which fifty-one were found adulterated and sixteen were found to be genuine milk. Offenders within the Sanitary and Local Board limits were prosecuted under the respective by-laws, but unfortunately there is no law to punish the culprits outside towns unless they supply to residents within town limits.

Town planning and improvements were carried out by the respective Local and Sanitary Boards, and the services of the sanitary engineer were lent to carry out the following work: Detail surveys for town planning were made of portions of Mount Lavinia, Watarappola, Nugagoda, and Kotte, and plans drawn. A scheme of new roads was laid out at Watarappola, in the Mount Lavinia district, a very insanitary area. Type plans were drawn of (a) Bakeries, with living accommodation. (b) Dairy, showing ideal arrangement of the various buildings on the premises and details thereof. (c) Cattle galas. (d) Rat-proof rice store for small towns.

Triangular Campaign Area.—The Director of the International Health Board started an anchylostomiasis campaign in the Minuwangoda area, where the majority of the houses had been provided with latrine accommodation. Unfortunately it was discovered later that, although through fear of prosecution the villagers had built latrines, a great majority did not use them, but instead resorted to jungles for calls of nature, thus re-infecting themselves after they had been cured. In order to educate these villagers as to the danger of soil pollution and improve the general sanitary conditions of the villages, it was decided to carry on a combined sanitary campaign within the triangular area included within Henaragitoda, Veyangoda, and Minuwangoda simultaneously with the anchylostomiasis treatment carried on by the Directors. Forty-five villages within this area were selected for this purpose, and sixteen sanitary inspectors were detailed for duty. A sufficient number of houses was allocated to each inspector to enable him to visit every house and garden once in a fortnight. This work was commenced in October. The different police headmen in each village were assigned to the respective inspectors, giving them opportunities of studying sanitation, and also at the same time to be a help to the sanitary staff. A course of lectures on sanitation was delivered to all these headmen at different centres.

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The Government Agent, Western Province, in the presence of the Sanitary Commissioner and the Directors of the Anchylostomiasis Campaign, personally addressed large gatherings of villagers and headmen in order to impress on them the importance of the work, and much enthusiasm was evinced by the people.

Railway Sanitation.—The following is a summary of work that has been done:—

During the year under review 2,092 latrines were found defective, of which 1,652 were attended to.

Two thousand three hundred and eighty-two mosquito-breeding places were discovered, of which 1,797 were dealt with.

In 589 cases the water supply has been found defective, of which 134 were attended to.

In 575 cases the conservancy was at fault, of which 457 were improved.

In 744 cases the scavenging was found defective, of which 530 were improved.

One thousand nine hundred and ninety-three drains were found defective, of which 1,471 were improved.

Two thousand one hundred and eighty-eight premises were found insanitary, of which 1,780 were improved.

Of the above, those unattended to are mainly major works, which require to be reported to the railway authorities, and for which money has to be found.

The following infectious diseases were reported and necessary action taken: Enteric, 21; dysentery, 3; chicken-pox, 27; phthisis, 2; measles, 3; mumps, 2.

Seventy-five written notices were sent out to various railway officers requesting them to improve insanitary conditions. It was only in a few instances that the improvements were not carried out, and the officer had to be reported to his chief.

Eighty-five communications were addressed to the Heads and District Officers of the various branches of the Railway Department pointing out deficiencies, sixty-six of which have been attended to. On the others action is pending for various reasons.

The coolie gangs doing sanitation work were taken over by the branch from October 1, and are now working satisfactorily under the direction of this branch.

It was observed that little or no quinine was being taken by the railway employees at the malarial stations in spite of the railway regulations, which require all railway employees to take it.

Definite proposals were tentatively put forward to have a systematic distribution of quinine during the fever season. The District Officers of the Northern District, to whom these proposals were addressed, all reported that the proposals meant extra work to the Railway Officers, and they were unable to cope with the extra work, in addition to their clerical duties. The matter was also discussed with the General Manager and the

engineer, Way and Works, and it is hoped that some satisfactory arrangements will be arrived at, as it is certain that a proper distribution of quinine would help to diminish the incidence of malaria at these stations.

Mr. W. Victor Fernando, who was appointed as Railway Anti-malarial Inspector, started work in March, 1921. The work has so far been carried out at twelve stations.

GENERAL.

Hospitals, Asylums and Dispensaries.—In 1921 there were seventy-eight Government general hospitals, providing 5,570 beds with varying accommodation, from sixteen beds in smaller out-stations to 711 beds in the General Hospital, Colombo. There are also a number of special hospitals in or near Colombo. Of these hospitals, eighty have an outdoor department also. Apart from the resident institutions, there are 475 dispensaries scattered throughout the island. The total number of out-patients treated was 2,111,536, who paid 3,117,023 visits. Lastly, there are sixty-eight estate hospitals and 480 estate dispensaries maintained by the proprietors of estates.

The following is a summary of the chief features of the report of the Medical Superintendent of the General Hospital, Colombo:—

On December 31, 1920, there were 730 patients remaining in hospital, forty-three in the paying section and 687 in the non-paying section. During the year no fewer than 16,407 cases were admitted, an increase of 1,636 over the admissions for 1920. At the Out-Patient Department there were 59,787 attendances, an average of 164 a day. Of the admissions, 964 were to the paying wards and 15,443 to the non-paying wards.

Of the 1,007 under treatment in the paying wards, 893 were discharged, sixty-eight died, and forty-six remained on December 31, 1921.

Of the 16,130 under treatment in the non-paying section, 13,500 were discharged, 1,896 died, and 734 remained on December 31, 1921.

The number of surgical operations performed, exclusive of twenty-eight minor operations in the Out-patient Department, was 2,300. Of these, 1,950 were in the non-paying section, with forty-four deaths, a percentage mortality of 2.2 per cent., and 350 were in the paying section with ten deaths, a percentage mortality of 2.8 per cent.

There has been a large increase in the number of patients admitted to the non-paying section in recent years. The number of available beds in this section is 655, whilst the daily average sick was no less than 801 in 1921. The overcrowding always existent adds materially to the work of the nursing staff and the difficulties of administration.

As regards particular diseases, the following table gives the numbers treated and the mortality.

Anchylostomiasis	...	...	812	...	135
Malaria	...	...	1,135	...	20
Dysentery	...	...	395	...	78
Appendicitis	...	...	203	...	3

Parangi	274	1
Pulmonary tuberculosis	765	346
Enteric fever	316	102
Pneumonia	470	235

The greatest increase was in the number of admissions for malaria, and during December some patients were admitted who had contracted malaria in Colombo town itself, where a malarial-carrying mosquito (*Anopheles leastoni*) had been found for the first time. An increase in the number of parangi cases admitted is to be noted, but this is believed to be due to the increasing knowledge of and appreciation of the benefits of the specific treatment now available. The apparent increase in cases of pulmonary tuberculosis is mainly due to the system now adopted of showing cases of over three months' stay in hospital as re-admissions.

Sixty-one private and 468 hospital patients attended the X-ray department, and, with few exceptions, all were sent for skiagrams.

A special venereal clinic (out-patient) for male patients was started in August, and is being well attended by patients from Colombo district. Up to December 31, 425 patients were treated.

The Colombo Lament Asylum.—Overcrowding is still a marked feature of this institution, and so is the lack of suitable accommodation for better class patients. During the year 115 males and forty-seven females were discharged. There were fifty-eight deaths amongst males and thirty-five amongst females, a total of ninety-three deaths. The principal causes of death were debility, 24; dysentery, 15; and phthisis, 29.

In the House of Observation there were twenty-three patients at the beginning of the year, and 352 were admitted. Of these, 119 males and fifty females were committed to the asylum, ninety-nine males and thirty-eight females were discharged, and five males and three females died.

Infectious Diseases Hospital, Colombo.—At this institution cases are admitted from Colombo and its environs and from infected ships arriving at the port. During the year seventy-four cases of plague were admitted; none of these were ship cases. As regards the type of the disease, sixty-six were bubonic, of whom fifteen recovered, and eight were septicaemic, all of which died. No cases of cholera were admitted. There were four admissions for diphtheria and eighty-two for measles. Fourteen cases of influenza and five cases of pneumonia were sent in as cases of suspected plague.

De Soysa Lying-in Home (100 Beds).—The number of cases under treatment was 3,506, an increase showing that the facilities offered there are becoming more and more appreciated. The death-rate was 2.29. Of the seventy-nine deaths, forty-one were due to the accidents of childbirth and purely puerperal causes; the other deaths were due to intercurrent diseases, such as ancylostomiasis, pneumonia, and dysentery. The number of births was 2,612; of these children, 2,225 left the hospital, 281 were stillborn, and 106 died soon after delivery. A total of 196 obstetrical operations were performed.

The Lady Harlock Hospital for Women and Lady Ridgeway Hospital for Children.—The former hospital (forty beds) receives cases of diseases peculiar to women mainly. During the year the daily average sick was 30.84, and the percentage mortality 7.39. 328 operations were performed.

In the Children's Hospital (fifty beds) the number of cases treated was 1,179. The daily average sick was 57.77. The number of surgical operations was 181. The mortality 27.56 is heavy still, as so many children are unfortunately only taken to the hospital as a last resource by their parents when they are moribund.

The Ceylon Medical College.—The apothecary students are being trained on the understanding that they take up the work of an estate dispenser. Medical students now receive their training in chemistry, physics, and biology at the University College.

MEDICAL AID TO IMMIGRANT COOLIES.

Various additions and improvements to the camp were effected, viz., five new coolie wards, eight segregation wards, dobbies' quarters, extension of sea water supply to all latrines, and certain new roads. The water supply was ample and of good quality. The electric installation was completed, and, besides the lighting of the camp, electric pumps are in use for pumping fresh water into the reservoir and sewage into the sea. The sanitary condition of the camp is excellent, and has been the subject of favourable comment by all visitors, both lay and medical. Crew for seventy steamers, numbering 2,599 persons, chiefly from Bombay and Calcutta, were passed through the camp. The rainfall was 36.63 in., as against 44.47 in 1920. No cases of plague occurred in the camp during the year, four cases of cholera were imported into the camp, and three cases of small-pox.

Medical Inspection of Estates.—Sanitary defects and deficiencies were brought to the notice of proprietors, and the necessary action urged upon them. Trade depression has resulted in many cases in little money being available for sanitary needs, but proprietors are reminded that due attention to sanitation pays for itself in the reduction of sickness amongst their staff.

School Medical Inspection.—The sanitary condition of many schools leaves much to be desired; in many of the vernacular schools there is neither a water supply nor any latrine. Further, the lack of any training in hygiene of the teachers in these schools is a serious bar to progress. Attention is drawn to the lack of a dental institute, where free treatment should be available for school children. In most European countries, where school medical inspection is yielding satisfactory results, there is a much higher standard of general sanitation; a reasonable knowledge of hygiene on the part of the teachers, and ample facilities for the treatment of the defects and ailments of the children of school age. Until these things, too, are available in Ceylon, little progress will be made as regards improvements in the personal habits and the

standard of health of school children. The best hope for the future improvement in the general sanitation of the island lies in the training of school children, so that as they become our future citizens, they will practise what they have been taught, and support all endeavours to improve the present unsatisfactory hygienic state of affairs in

the island generally. Hence, every effort should be made to lay the foundation of a sanitary conscience in the impressionable minds of school children, and to do this it is necessary that all schools should show examples of sanitary premises, and that the school teachers should have had a training in hygienic principles.

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ANNUAL REPORT OF THE SUPERINTENDING MEDICAL OFFICER FOR THE YEAR ENDED DECEMBER 31, 1920.

INFECTIVE DISEASES.

Enteric Fever (typhoid and paratyphoid). The disease seems endemic in some districts. All nurses and probationers at the Kingston Public Hospital get prophylactic inoculation of T.A.B., and though they frequently come in contact with this disease, the incidence of typhoid fever amongst them is extremely low. The general public are slowly recognizing the value of protection against this very fatal disease, and an increasing number are seeking inoculation.

Malaria.—This disease continues to be prevalent throughout the year, but the consensus of opinion amongst D.M.O.s is that the type is not so severe as in previous years.

Quinine prophylaxis is being carried out, and large quantities are issued by this Department for sale at the post offices in the island.

Alastrim or Kaffir Milk Pox.—The outstanding medical feature during the period under review was an epidemic of an eruptive fever known as alastrim, or kaffir milk pox, which broke out in Kingston in May, and from Kingston spread to the other parts of the island. It is satisfactory to note that the death-rate was exceptionally low.

The epidemic is still in existence, but is markedly on the decline, both in incidence and type.

Attached is a Memorandum issued to all D.M.O.s and others having to deal with the epidemic, also extract from a report by the bacteriologist, who made complete and exhaustive examination in connection with it. A satisfactory feature in connection with this epidemic is that better protection now exists against smallpox (an ever-present menace) than ever before in Jamaica, large numbers of the inhabitants having been vaccinated and re-vaccinated.

ALASTRIM.

(Synonyms: *Kaffir Milk Pox*, *Ammas*.)

Definition.—A disease characterized by sudden onset usually with headache and a febrile state lasting most frequently from two to three days, at the end of which period a papular eruption appears

on the skin, and in the succeeding days passes through stages of vesicle pustule and crust.

The onset is with a rise of temperature, ranging generally between 100° to 103° F., and headache, often severe.

Pain in the small of the back is present in a number of cases and is generally mild; whilst in other cases there are generalized pains in the limbs such as occur at the onset of influenza.

Vomiting is nearly always absent; and, if present, is never severe, occurring usually not more than once or twice.

There is general malaise and constipation.

With the appearance of the eruption the constitution symptoms abate, and the patient is practically well until the tension in the skin, consequent on the maturation of the vesicle, puts an end to his happiness. The pain of maturation is most marked where the skin is thickest—namely, the palms of hands and soles of feet. But the fever of maturation is usually only very moderate.

Eruption.—No prodromal rashes have been noted so far.

The eruption appears most frequently on the third day of illness, but may appear as early as the second or as late as the fifth day. It is from the first papular and feels fairly superficial, and is, in the lighter skin, surrounded by a red areola. It rapidly becomes vesicular, and usually begins to be pustular by the fifth day after it has made its appearance. Drying and crusting begin on the sixth or seventh day and proceed rapidly, so that in all but the more severe cases the scales on the face are frequently off by the tenth or twelfth day after the rash has appeared.

In cases in which the rash is heavy the development of the pock is accompanied by marked oedema of the subcutaneous tissues, and this may cause almost complete closure of the eyes. In the milder cases oedema is present, but is not severe.

In a number of the cases some of the pocks never become pustular but start to dry in the vesicular stage; especially is this the case when they are injured; and in many cases the pus never advances to the stage of being thick and yellow.

RETURN OF DISEASES AND DEATHS IN 1920-21 IN THE PUBLIC HOSPITAL, KINGSTON.

Jamaica.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases treated
Alcoholism	188	2	188
Anæmia	87	4	87
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	17	—	17
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	10	1	10
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	45	—	45
Dysentery	49	14	49
Enteric Fever	263	46	263
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	13	—	13
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	21	—	21
Kala-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	—	—	—
(a) Intermittent	106	14	106
Quotidian	—	—	—
Tertian	178	15	178
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	11	—	11
New Growths—	—	—	—
Non-malignant	1	—	1
Malignant	53	2	53
Old Age	—	—	—
Other Diseases	554	66	554
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	42	8	42
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	20	4	20
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(a) Primary	—	—	—
(b) Secondary	67	4	67
(c) Tertiary	171	13	171
(d) Congenital	40	3	40
Tetanus	4	—	4
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(a) Phthisis Pulmonalis	70	26	70
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

GENERAL DISEASES—continued.

(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	55	11	55
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	14	2	14
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—	—	—	—
Cellular Tissue	123	17	123
Circulatory System	196	63	196
(a) Valvular Disease of Heart	—	—	—
(b) Other Diseases	301	77	301
Digestive System—	—	—	—
(a) Diarrhœa	—	—	—
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	4	—	4
(g) Cirrhosis of Liver	—	—	—
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	8	—	8
Ear	—	—	—
Eye	47	—	47
Generative System—	—	—	—
Male Organs	144	14	144
Female Organs	107	17	107
Lymphatic System	91	12	91
Mental Diseases	17	2	17
Nervous System	22	8	22
Nose	8	—	8
Organs of Locomotion	—	—	—
Respiratory System	203	35	203
Skin	94	—	94
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	—
(d) Favus	—	—	—
(e) Eczema	—	—	—
(f) Other Diseases	—	—	—
Urinary System	129	13	129
Injuries, General, Local—	226	8	226
(a) Striasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	56	—	56
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmima duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	4	1	4
Snake bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

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The distribution is largely that of smallpox—chiefly on the face and extremities and upper part of the back. The face never escapes; and a few pocks can generally be found on the palms and soles even in mild cases. The scalp is also uniformly affected, though the rash here is frequently scanty. In the severe cases vesicles are sometimes found in the mouth on the hard and soft palate and on the fances, but have not been seen on the conjunctiva, though they are present often on the margin of the lids.

The individual lesion is unilocular and can be emptied by a single prick. It is more superficial than that of smallpox, and is very generally not umbilicated. An appearance of umbilication is often due to some small crusting in the centre of the vesicle. But even where umbilication is fairly definite the vesicle is still unilocular.

General Symptoms and Signs.—Apart from the symptoms of onset and the symptoms due to the eruption, there is often present pain in the throat which on inspection is injected or may show the presence of pocks, and the glands at the angle of the jaw are often enlarged and somewhat tender.

Adenitis in other regions is absent as a general rule, apart from secondary infections.

There is no palpable enlargement of liver or spleen, and albuminuria is absent unless due to some other cause.

Course.—The disease runs a mild course, except for the malaise of onset and the pain of maturation; and the appetite is good. The course is almost uniformly uneventful, but in some of the severer cases trauma may cause great areas of the skin to be raw.

Complications and Sequela are practically non-existent. Boils occur in a number of patients, and in others there is a certain amount of falling of the hair afterwards. Raw areas of skin caused by trauma in the severer cases may prove troublesome.

Diagnosis.—The diagnosis from true smallpox rests on the following points:—

(1) The comparative slightness of the constitutional symptoms, especially the general absence of severe backache.

(2) The unilocular character of the vesicles.

(3) The co-existence of severe rash and comparatively slight effects even at the height of pustulation.

(4) The very low mortality even in children.

(5) The general rapidity of the course of the disease.

(6) In women menstruation is absent unless a regular period has arrived.

Prognosis and Treatment.—The prognosis is good and the treatment is "secundum artem." The protection afforded by Jennerian vaccination is definite but not absolute.

Extract from a Report by the Bacteriologist on Alastrim.

RESEARCH WORK.

For some few months before my arrival in the Colony an epidemic of an eruptive fever described

as alastrim, or Kaffir milk pox, broke out in Kingston, and from Kingston spread to the other parts of the island. Up till the end of March, 1921, about 6,000 have occurred throughout the island.

Altogether notes on 202 cases were taken; bits of tissue were removed for microscopic examinations; eight post-mortems were performed; animals were inoculated; photographs were taken; and sixty cases were vaccinated after their attack of alastrim.

CLINICAL ASPECT.

Owing to the difficulty of getting cases in which exposure occurred only once, and that for a short time, it has been impossible to determine the exact period of incubation.

The onset of the disease is sudden. There is a constant rise of temperature accompanied by headache and backache, and occasionally pains in the limbs and vomiting.

Of 202 cases of both sexes (133 males and 69 females) the incidence of the various symptoms of onset were as follows: Headache, 172 cases; backache, 111 cases; pain in limbs, 41 cases; vomiting, 32 cases.

The headache when present was generally severe and often either frontal or vertical.

The combination of headache, vomiting and pain in the back occurred in only twenty-one of the patients, and of these only six vomited more than once, and only one more than three times. In the majority of cases the tongue was furred and constipation was present.

The characteristic eruption appeared with about equal frequency on the third or fourth day after the onset of the symptoms.

Either shortly before or after the appearance of the rash the temperature falls and the constitutional symptoms disappear. The patient is then quite happy until maturation begins, when for two or three days there is a great deal of pain from the tension under the skin. In a number of cases there is also secondary fever. No prodromal rashes were seen. Delirium was never observed.

The deep depression which occurs at the onset of true smallpox was uniformly absent.

Pain in the throat and dysphagia, accompanied in some cases by aphonia and enlargement of the glands of the neck, were noted as occurring in a number of cases.

Three cases had bronchitis signs in the chest, and for a few days coughed up blood-stained sputum. In two cases there was profuse diarrhoea at the onset, but the majority were constipated.

The Urine.—In fifty cases whose urines were examined albuminuria was absent. Unfortunately no urines were obtained before the eruption appeared, and in none of the cases was the examination performed more than once. There was one case of diabetes; the eruption ran the usual course in him, but was followed by a large amount of pus.

Eruption.—Patients do not usually come under observation until the rash is well developed; but in two cases which were admitted to the Isolation Hospital in the pre-eruptive stage, the rash

appeared as small papules, which to the touch were quite superficially situated. These papules became vesicular in about thirty-six hours.

The vesicles are circular in shape, and when fully mature are from 4 to 5 mm. in diameter. The summit is either dome-shaped or flattened and frequently shows a darkened central area. In the early stages the vesicles, if pricked, yield a clear serum quite free from cells, but polynuclear leucocytes begin to appear in the fluid on the second or third day, and gradually increase in numbers until turbid fluids, or even sometimes thick pus is formed. At this stage the lesion is very tense, hard and shotty.

In the lighter coloured skins a definite red areola surrounds each pock. Primary umbilication is not often, if ever, seen, but on about the eighth or ninth day a secondary umbilication or flattening takes place and is due to resorption of fluid.

The eruption is subject to variation, but, broadly speaking, two main types are distinguishable: the one type being finer and more closely set, and the other being large and more distinct. Sometimes both types are found in the same patient, the vesicles then presenting a very unequal appearance. The finer eruption has far less tendency to form thick pus, but the general course was similar to the larger variety.

A number of confluent and two hæmorrhagic cases occurred in this series (altogether four cases of hæmorrhagic rash have been brought to my notice, all occurring in women six to seven months pregnant, and all fatal).

Appearance.—The rash makes its appearance or, at all events, is first noticed in certain positions. These are in order of frequency, the face, especially the forehead, and the dorsum of the wrist or forearm.

Although in heavier cases the whole body may be covered, the rash shows a predilection for certain areas. It tends heavily to affect the face, the lower half of the back and the arm and forearm, especially towards the wrists.

The Scalp.—The rash was present on the scalp in all cases examined; the lesions, however, were often few in number.

The Mouth.—Pocks were frequently seen on the hard and soft palate, and to a less extent on the pillars of the fauces and the inside of the cheeks. In four cases the frænum of the tongue was also affected.

Larynx.—Hoarseness of voice and sometimes aphonia were present in the majority of the severe cases and in a fair proportion of the other cases. Mirrors, &c., for laryngoscopy were not available, but in three of the cases pocks were present in the larynx and trachea—post mortem.

Palms and Soles.—In all the 202 cases pocks were seen on the palms and soles. In some the incidence here was very heavy and caused much pain and discomfort. No lesions under the nails were noticed.

The Genitals. especially the prepuce, were often

affected, and there were in a few cases much swelling, pain and difficulty of micturition.

The intensive treatment of yaws with the salvarsan preparations is giving the most successful and satisfactory results met with in tropical medicine.

It is confidently expected that in a few years yaws, if not eradicated, will be so under control as to be practically negligible.

Veneral Disease.—Treatment of this disease continues, but to a limited extent. Individuals suffering from venereal disease rarely, if ever, apply for treatment in the early stages, and as soon as their acute symptoms are relieved demand discharge if patients in hospital, or do not continue treatment if attending as out-patients, thereby spreading venereal disease. This failure to get cured is, in my opinion, one of the main causes of the prevalence of these diseases in this Colony. The problem is a very vast one, and to adopt active curative measures for the treatment of venereal disease requires the expenditure of a large sum of money.

REPORT OF THE JAMAICA HOOKWORM CAMPAIGN FOR 1920.

Object of the Jamaica Hookworm Campaign.—The object of the Jamaica Hookworm Campaign is to co-operate with the Government Medical Service in demonstrating the importance of hookworm and the other soil pollution (bowel) diseases; in showing the necessity for the control of these diseases; and to devise practical methods for such control, hookworm disease being taken as a type of this class of disease.

The definite work of the campaign is to examine the population of selected areas and to give treatment to those who are found to be infected; also, to teach the people the necessity for using the latrines which had been erected before the beginning of the campaign through the influence of the Central Board of Health.

Routine Method of Work.—The parish in which the campaign is being conducted is divided into areas. An area is divided into districts, each of which consists of a village or settlement of from 500 to 700 people; and each such district is placed in charge of a dispensing nurse, who is held responsible for the work of his district. Before a nurse begins his work, lectures illustrated with either the magic lantern or charts are given by the medical director at the schools and other public gathering places.

In carrying out the work in a district the nurse goes from home to home, marking each house with a number; and he records the name, age, sex of each inmate. A small tin box (container) is left for each person, with instructions for the preparation of a specimen of bowel material for microscopic examination. These specimens are collected on the following day by the nurse. At the time of these first visits the nurse takes time to explain at each home the details of hookworm disease and its

vention. For this work he is supplied with an album of local photographs, which shows in detail the ways the disease is contracted, its effects on the patients, and the results following treatment. Reports are also made to each district by a microscopist, who takes his microscope from house to house, and demonstrates the eggs and larvæ of the hookworm in order to emphasize the necessity of using the latrines.

The specimens collected by the nurse are brought to the central office laboratory for examination. The microscopical work is carefully supervised and the most improved technique is used. Each specimen is examined by at least two microscopists, and in every case the results of each assistant are verified.

Nurses are required to make daily reports and complete records are kept of each case. A treatment book is prepared by the clerks, and those who are found to be infected are visited by the Medical Director, and each patient is "sounded" (examined with the stethoscope) and prescribed for individually. The treatment is carried to the people in their homes, and each patient takes his medicine in the presence of the nurse to ensure correct dosage and results. A person is pronounced cured only after a specimen, submitted at least a week after treatment, is found by careful examination to be negative. After being cured a patient is given a certificate, such certificates also being given to those found not to have hookworm.

The Vere Area.—The campaign opened in this area; the people are mainly Creoles and East Indians. The majority of the East Indians live on the estates, though quite a number of Indian families are found in the villages. The estates, it might be well to mention, also have barracks for labourers.

Taken as a whole the results of the campaign in the Vere Area are very gratifying. The estate owners and managers have expressed themselves as being highly pleased with the benefits of the treatment for hookworm disease and of the increased working ability of their employees. Also, the institution of sanitary latrines has greatly lessened the incidence of dysentery, typhoid and other bowel diseases.

In January, 1920, the Vere estates employed a full-time sanitary inspector, who was given statutory powers to work on the estates and neighbouring villages. In May an additional assistant sanitary inspector was employed, and routine post-campaign hookworm work was instituted under the supervision of Dr. Cassidy, the Medical Officer of Health. This post-campaign work consists of making examinations and treating the infected at estate barracks and villages in addition to regular and systematic sanitary inspection.

The Race Course Area.—The Race Course Area is directly west of the Vere Area, and consists of a number of scattered villages, cattle pens, and estates in the large territory composing the southwestern part of Clarendon Parish. The majority of the people of the Race Course Area are Creoles,

though a number of East Indians live at the estates as well as in the villages of Kemps Hill, Manningsfield and Gie-me-me-bit.

The additional work in this area consisted of magic lantern and chart lectures, album explanations, microscopic demonstrations, and the use of handbills and circulars.

As a result of this intensive educational work the co-operation of the people was exceptionally good. In this area, as was the case in the Vere Area, the estate managers expressed themselves as being highly pleased with the results of the hookworm campaign in that it increased the efficiency of their labourers. Many labourers now earn double the wages they received before treatment, and many are now able to work who formerly were invalids. The interest of the people in building their own latrines was also gratifying.

Although the infection in the Race Course Area was not high, the campaign resulted in creating, in a measure at least, a sanitary sense among the people. The improved sanitation and the removal of mass infection, with the dryness of the area, should make the results more or less permanent.

The Spanish Town Area.—In anticipation of beginning the treatment work in December, the main office was moved to Spanish Town at the end of November. It was found, however, that the sanitary work had not been completed and that the area would not be ready for the campaign before the end of January. For this reason examination and treatment were given at the Rio Cobre Children's Home and the St. Catherine Poor House during December.

At the Rio Cobre Home sixty-five of the seventy-two inmates were found to be infected with intestinal parasites as follows: Hookworm, 32; ascariis, 13; trichocephalus, 49; strongyloides, 1.

In some cases the same child was found to be infected with three different kinds of parasites. Hæmoglobin tests showed a marked anæmia in the children infected with hookworm. The Tallquist Scale was used with the following findings: Two showed 50 per cent. hæmoglobin; fifteen showed 60 per cent. hæmoglobin; twelve showed 70 per cent. hæmoglobin; three showed 80 per cent. hæmoglobin.

At the Poor House 161 of the 170 inmates were examined; those not examined were suffering from acute illness. Of the ones examined, eighty were found to have hookworm.

Educational Work.—As has already been stated, a large part of the treatment campaign was devoted to educational work, and this feature of the campaign was attended by much success. Lectures, with magic lantern slides, were given in each village by the medical officer, and pamphlets and leaflets were distributed at the houses and schools. On Sunday, the one day of the week when nearly everyone can be found at home, the Medical Director, clerks, and microscopists visit the districts for the purpose of conducting detailed educational work. Chart lectures were given at prearranged centres, whenever a dozen or more people could be

brought together, and specimens of hookworms and other parasites were shown. The microscopes were used to demonstrate hookworm eggs and larvæ and to impress upon the people the necessity of using the latrines which the Government had caused to be built at each home. Infected persons were also seen and "sounded" in these Sunday morning visits by the Medical Director.

In the work of the treatment campaign in the Vere and Race Course Areas the detailed educational work was more successful—it was highly popular. The people were interested and eager to attend the lectures, often coming from villages miles away; and as a result they gave their specimens and took their treatments very readily. They also showed great interest in sanitation, and many householders provided latrines of a better type than the type built by the Government.

It was very pleasing to find that all classes can be reached by properly adapted educational work, and that the results of teaching the people the details of hookworm disease and sanitation caused more thorough and willing co-operation. The beginning of a sanitary sense has been created in the Vere and Race Course Areas, and if the Government can arrange for systematic work in all parts of those areas, such as has been introduced by the Vere Estates Company in their districts, this sanitary sense will last and exert itself and guarantee better health and greater prosperity to the people. All this will make them better citizens.

B. E. WASHBURN,
Director of the Campaign.

HOOKEWORM CAMPAIGN IN THE VERE DISTRICT.

*Lionel Town Hospital, Alley P.O.,
April 21, 1921.*

In April, 1920, Dr. Washburn completed his campaign in the Lionel Town Area, and every home and all the estates in the area were provided with latrines. The whole population had been dealt with, and hookworm disease was temporarily eradicated. The situation was explained to Mr. A. W. Farquharson, and it was pointed out that unless an intensive campaign was undertaken in which the development of sanitation would be insisted upon, the district would relapse into its original condition, in which the infection rate was 42·4 per cent.

The campaign began at the Amity Hall group of estates in July, when a census of all the cane farms was taken, and arrangements made for the microscopic examination of a specimen from each inhabitant. Six months had elapsed from the completion of Dr. Washburn's work on the cane farms. It was found that the percentage of reinfection reached 18·4 per cent., while the original infection rate was 45·12 per cent.

No difficulty was experienced in collecting specimens, and those infected accepted treatment readily. In every case the diagnosis was made

microscopically, and no case was considered cured until the microscope confirmed the cure. A similar procedure was followed throughout every stage of the campaign, and in no case was any difficulty experienced in carrying out the work. The treatment in every case consisted of the administration of thymol and compound jalap powder, without ginger. Thymol was found to give more satisfactory results as no unpleasant consequences resulted from its use. It is in my opinion most suitable for intensive work on a large scale as chenopodium is apt to give rise in an appreciable number of cases to unpleasant symptoms, and is slower in its action in removing the parasites. This last is an important consideration, for the thymol treatment acts more rapidly and enables one to re-examine stools a week after its administration. When chenopodium is given it is unwise to re-examine stools until a fortnight has elapsed.

The routine treatment was the administration of an initial dose of 60 gr. of jalap powder in the evening, followed by 40 gr. of thymol and 60 gr. of jalap powder, divided into two doses, on the following morning. In the case of children who were unable to swallow capsules, the treatment was given in condensed milk, and was taken readily.

Attention was given to the sanitary side of the work. During its progress it became evident that the only type of latrine which is within the financial resources of the people and which will be used is the pit latrine. There is evidence of increasing use of the pit type, and with the development of educational influence, and if the sanitary laws are enforced, it is reasonable to hope that hookworm disease will be controlled.

The campaign has a much wider aspect than the mere control of hookworm, for with the more regular use of latrines, the typhoid fevers, and the dysenteries will also pass under control. The original infection rate was 42·4 per cent., while the rate disclosed by the past campaign was 9·5 per cent., but this is not the only gratifying feature of the work, for it was found that the great majority of our cases were cured by two treatments, and in no case more than four treatments were necessary.

In Dr. Washburn's series of cases, 386 cases required four treatments for cure, while 194 others required from five to nine treatments before a cure could be demonstrated.

KINGSTON.

June 24, 1921.

During the first quarter of the year the health of the district was fairly good; but as time went on sickness of various kinds became more and more prevalent until September, when both the morbidity and mortality rates were very high. Apart from the epidemic of alastrim beginning in May and lasting until the end of the year, measles, whooping-cough and other infective diseases, as well as bowel complaints, were unusually prevalent.

Colonial Medical Reports.—No. 150.—Jamaica (continued).

As regards the sanitary conditions of the district, my remarks in my last year's report still apply generally. The additional source of water supply therein foreshadowed has not yet become an accomplished fact, nor could this have been reasonably expected, for the Kingston General Commissioners could hardly have embarked on such an expensive and ambitious enterprise at a time when they, along with the Mayor and Council, are in the melting-pot.

Overcrowding and bad housing are as much in evidence as ever, and no improvement in these respects are discernible as yet.

As regards mortality, the highest rate was reached in the autumn, 232 deaths being registered in September. The chief killing diseases were those connected with the digestive and respiratory systems, and also enteric fever. The following are the figures:—

Diarrhœa and enteritis ...	222		
Dysentery	85	...	307 digestive
Phthisis	258		
Enteric fever	130	...	388 respiratory

In contrast with these figures, the fifteen deaths recorded under the head of alastrim seem trivial and insignificant. It is difficult to appreciate or even to understand the attitude of mind which become panicky over the latter, while the former, veritable destroying angels, are regarded practically with equanimity, if not with indifference; and these, be it remembered, due to defective sanitary conditions and distinctly preventable.

With respect to meteorological conditions, the year was one of almost continuous dry weather and high winds. As a result of the drought and consequent scarcity of water, the watering of the streets was perforce neglected, and the resultant dust caused a considerable amount of throat and eye affections.

PORT ANTONIO.

April 25, 1921.

As regards the prevalence of sickness in the different seasons of the year, the only noticeable feature in this connection was the increase in the number of malarial cases during the summer months.

The same primitive system of disposing of night soil is still in vogue.

The town is comparatively free, one might almost say singularly free, from mosquitoes. This is to be wondered at, considering the low-lying nature of much of the land in its neighbourhood and of a considerable portion of the town itself.

The unprecedented drought was the only unusual meteorological feature that requires comment. It began in February, 1920, and lasted practically a year. I do not think the sick rate was affected by it.

The alastrim epidemic began in July. I have

always been opposed to making so much of alastrim; it kills no one, and to my mind, except for the longer duration, is no worse than a bad attack of coryza.

The treatment of yaws by means of one of the "salvarsan" preparations has been carried on vigorously. The most intractable are those suffering from yaws ulcers.

Pulmonary tuberculosis was responsible for the death of sixteen of the inmates of the Poor House.

There has been a marked increase in the number of venereal cases, both syphilis and gonorrhœa showing a much larger increase than any previous year.

I have never been in favour of the free treatment of those diseases; in my opinion it is simply encouraging people to be immoral, and is not fair to the honest taxpayer.

BUFF BAY.

April 15, 1921.

Malarial fevers were very prevalent in the months of November and December, the months of heaviest rainfall.

Enteric fevers have been epidemic throughout the year.

Alastrim became epidemic during the month of October, gradually waned during December, and re-assumed epidemic form in January.

A new disease has been observed, which tentatively I have diagnosed as "infective stomatitis," but which appears to be identical with the epidemic which occurred at Spanish Town in 1918, and was investigated by Dr. Scott, who seemed to regard the condition as a "central neuritis" of toxic nature due to the growing and eating of sugar-cane. I believe the condition to be an infection primarily, and the subsequent neuritis to be due to bactericidal toxins.

Water Supply.—This remains in as unsatisfactory a condition as heretofore. The chief towns of the district derive their supply from wells, for the most part shallow and neighbouring closely upon pit closets. It appears a waste of time reiterating year after year, without any practical results obtaining, the same comment relative to this essential feature of health and existence, I abstain from repeating again the remarks contained in my reports for many years past.

There are no public tanks in the district.

Disposal of Sewage.—My remarks above apply, too, in connection with sewage disposal.

In the villages the surface of the ground in the banana walks, in their back yards, and even on the public highways, is the site of election for the deposit of their stores.

There is a dumping-ground just outside the town of Buff Bay at Woodstock, but I am credibly informed that it has not been used for the greater part of the year, but that all waste matter has been dumped in the grounds of a member of the local Board of Health resident in the town of Buff Bay.

Latrines.—The vast majority are not fly-proof, and are open to the depredations of bird and beast.

Buff Bay on the whole is very well drained by concrete gutters.

Overcrowding obtains, and will so continue until the housing and labour problems are solved. This *per se* would be of little moment, were it not for the fact that the natives shut out the "ghosts" or "duppies" contained in the fresh air by closing every crevice of their homes during the hours of sleep.

Metecorological Conditions.—There was a severe drought from April to July, but fortunately this did not appear to very materially affect the public health.

The incidence of yaws has been most markedly reduced as a result of the vigorous Yaws Campaign, commenced in October, 1919, and continued to the end of December, 1920. 1,406 cases have been treated in the districts, 1,398 of which have been cured, one died, and seven remain under treatment.

In its several stages syphilis is exceedingly prevalent in the district, and is largely accountable for the many interrupted pregnancies which have occurred. It is met with chiefly in the congenital and tertiary forms, and is very noticeable among the young. It appears to be steadily increasing.

Gonorrhoea.—This with its many sequelae is extraordinarily widespread in the district, and in many instances one notes a particularly resistant and virile strain of gonococci character, with certain complications such as cystitis and rheumatism.

ANNOTTO BAY.

April 13, 1921.

With the exception of the epidemic of alastrim there has been no unusual prevalence of any particular disease during the year.

Annotto Bay is the only town in this district which has a water supply.

The water obtainable from the rivers and streams is subject to every kind of pollution. There are no tanks in the Annotto Bay district.

The dumping-ground is situated about half a mile out of the town due south on a part of Gibraltar land. Here pits are dug and the buckets emptied into them, and as soon as the dumped material reaches to within 3 ft. at the top the hole is filled in. Owing to the low level of the land, the clay soil and the almost complete absence of drainage, these pits become filled with water in heavy weather, and then it becomes necessary to empty the buckets into the sea.

In the town of Annotto Bay the law requires every house to have its latrine, the floor of which must be constructed with concrete and a bucket used. There are no surface closets, pits, or trenches, and there are no latrines open to the depredations of birds or beasts. The drainage of the town of Annotto Bay is very bad.

Overcrowding is universal, even in the hospital,

where there are seventy-five beds in a space not large enough for more than sixty.

All the sanitary conditions, &c., apply to the town of Annotto Bay; in the villages outside there are no sanitary measures of any kind. The water supply is usually obtained from the nearest river or stream, which is open to all kinds of pollution. There are very few latrines, the majority of the people living in the districts go to the bush, and where a latrine does exist it is in nearly every instance an open surface one. The better class houses have latrines which consist of a surface pit and are open to the depredation of birds and beasts.

Overcrowding in the country districts is even worse than in the town. It is simply appalling to see the hovels in which the peasantry class live. It is miraculous how so many of them survive and why more of them do not die from pulmonary tuberculosis.

There have been no sanitary improvements carried out by the Local Board of Health.

I do not think the population of the district is sufficiently well protected against smallpox to ensure against an outbreak of the epidemic should it arise. Vaccination has been carried out during the latter part of 1920 as thoroughly as possible. This is partly due to the wet weather, partly to the scarcity of food and clothing, but chiefly to the fact that they have discovered that vaccination of adults is not compulsory.

There appears to be very little yaws in the district now. It has been so thoroughly treated during the past two years that one does not hear much of it now.

The chief localities in which it has been noted here: Fort George, Baxter's Mountain, Pleasant Hill, Annotto River, Epsom, Enfield, Juno Pen, and Mount Joseph.

The number of cases treated for the year under review was 1,332. Of these 949 are known to have had the symptoms cured.

The number of persons known to be infected with hookworm is: Creoles, fifty-three with one death; coolies, thirty-seven with four deaths.

Syphilis is very prevalent and is accountable for a large number of miscarriages. The stage in which the disease is most often seen is the tertiary. The disease is quite common among young people, and is undoubtedly on the increase.

Gonorrhoea is even more prevalent than syphilis. Complications are common, and a cause of the very large proportion of the disability of the working classes due to disease accounting for large numbers of miscarriages and invalidism from endometritis, salpingitis, and peri- and parametritis. This disease is also on the increase.

PORT MARIA.

June 30, 1921.

It has always been gratifying to me to record the gradual lessening in incidence of malarial fevers in this district for the past eight years, but it is with

al regret that I have to report the unusual valence of this disease during the period under ew. In all 261 cases were admitted to hospital, very many more were treated in private practice. The disease was also unusually severe, and many malignant cases were seen which accounted for a few deaths. During the severe drought many the smaller rivers and springs ran dry, and when did break in November, instead of the usual heavy downpour which would have caused a general washing out, only intermittent showers fell, which dried up trenches, pools, &c., and the Anophelines to the rest.

Sanitary Conditions.—The water supply of Port Antonio and its environs is the same as previously reported. The supply constant, except in times of severe drought, yielding over 200,000 gallons daily, is unquestioned. Protection from pollution is complete. Hardness of the water is, however, still a great trouble. There are no public tanks, but protected wells at Salt Gut and Galina, and protected springs at Oracabessa and other places. Few latrines are fly-proof, but none are accessible to man or beast.

Drainage throughout the district is good. Overcrowding exists, and is becoming more marked in the yard-rooms, in the town, and in the barracks of some of the estates.

Meteorological Conditions.—The year was marked by a long and unprecedented drought, the rainfall of the whole year hardly equalling that of one month in ordinary times.

Infective Disease.—The outstanding feature of the year has been alastrim.

As to the nature of the disease there has been no difference of opinion. It is generally admitted, however, that it is of the same type as that which occurred in Trinidad, 1901-3, and again in New South Wales, 1913-14.

Ankylostomiasis is prevalent, but it is impossible to state the number of cases. There were two deaths from this disease registered.

Syphilis is still very prevalent, and gonorrhœa is so on the increase, though of course more persons take advantage of the free treatment.

MORTEGO BAY.

June 23, 1921.

We have had quite a series of minor epidemics, none attended with quite a relatively large mortality.

In my previous report I mentioned that pneumonia had been prevalent during the latter part of 1919. The disease has of late been extraordinarily common and has not been confined to any one quarter. For the most part these have been lobar type and there has been a large mortality. Of eighteen cases treated in hospital there were five deaths, but the death-rate in those treated at their homes was even greater.

Pulmonary Tuberculosis.—This disease has, if anything, been more marked than in the previous year, and there has been twenty-nine cases notified.

I again reiterate my suggestion of a year ago that the sooner a tuberculosis hospital is built the better for the community at large, as nine-tenths of the cases have to be treated in their own homes, where absolutely no precautions are taken.

Dysentery.—In April, 1919, we had quite a sharp attack of bacillary dysentery. This came on after the break of the prolonged drought.

Alastrim made its advent on August 18, and continued to the end of the year with slight fluctuations.

Malaria was more than ever prevalent in the last two months of the year when there was a plague of mosquitoes, which was so bad that a large part of the town had to resort to smoke fires at night. Here again I must reiterate the suggestion of removing the scrub from the honeycomb rocks around the town as one of the most practical steps in eradicating the disease.

Typhoid fever is endemic in the district. As many of the cases go untreated for a week or more and no precautions taken, it is not unlikely that it will increase now that we have a plague of flies.

Regarding the sanitary conditions of the district, the condition of Montego Bay itself gradually grows worse with unswept drains and sidewalks and general filth of the streets, with dead cats and dogs left to the tender care of the "John Crows," at times the sole scavengers of the streets.

The water supply in the town has been better during the last year, due to the benevolence of the Almighty in sending rain, as the supply as reported in my last return is so inadequate that, after about three weeks drought, it is already short.

Yaws.—There are very few cases at present. As I pointed out in my last report, this is to a large extent due to the fact that the medical officer of health has for years been treating the disease with injections of arsenical preparations.

Hookworm.—This, though prevalent, is not remarkably so in the Montego Bay medical district. Marlton and John's Hall are apparently infested with the disease.

Syphilis.—Still continues prevalent, but a very small percentage are ever seen in the primary stage.

RACE COURSE P.O.

April 30, 1921.

The year under review was one of continual drought, consequently the usual seasonal outbreaks of malaria did not occur.

Waste supplies of a rural district like Vere must always be a problem. The available sources are: a few public wells in the larger villages, numerous private wells near the sea, where the cost of sinking them is small, estate wells, irrigation water,

and the two rivers which at infrequent intervals flow through the district. With the exception of the wells on the estates, none of these sources are protected against pollution. In certain villages, notably Hayes, an almost perpetual water famine exists. The village of Hayes covers a large area, and the population is round about 1,000, and it is served by a single public well over 100 ft. deep, from which water is drawn by hand.

In the Race Course Area the wells are more numerous, but here again no provision is made against pollution. At Banks and Sedge Pond there are no wells, and the people have to travel considerable distances to neighbouring estates to obtain water. There are no public tanks in the district.

Latrines.—Every house in the district has been provided with a latrine, and all surface latrines have been abolished. All the latrines are of the pit type. In those villages with buckets an attempt is being made to convert them into pits, for it was found that in the absence of arrangements for the regular collection and disposal of the night soil the latrines were either not used, or in the rare instances where they were used, the night soil was usually thrown into an adjoining lot.

Overcrowding is prevalent, for the majority of the houses are so small that overcrowding is inevitable. The immediate effects of this overcrowding must be a progressive increase in the tuberculosis rate, and a very strong contributory cause to the alarming incidence of venereal disease in the island. It is not lack of ambition which prevents the average native labourer from building a house, but lack of money.

Twenty-six cases of pulmonary tuberculosis were admitted into Lionel Town Hospital. Eight patients died, while the remainder, after spending varying periods in hospital, went home to act as local centres of infection.

Syphilis is prevalent, and to an extent that it is the most serious menace to the public health which exists to-day. Among the young adult population its prevalence is lamentable, and there can be no doubt whatever that the disease is increasing.

Gonorrhoea is also very common. As an invalidating cause among the women of the island its importance cannot be over-estimated.

PATHOLOGICAL LABORATORY, PUBLIC HOSPITAL, KINGSTON.

During the period under review research work was undertaken in connection with the epidemic of alastrim, and a full account of the work to date was sent in for the period ending March, 1921.

As regards the routine work of the laboratory, 3,136 specimens have been examined, but I desire to draw attention to the three following points:—

(1) *The large number of positive Widal reactions which have occurred.*—In December, of 173 bloods

sent for examination, ninety-four, or more than 54 per cent. were positive, and for the whole period of seven months 303, or nearly 40 per cent., of the bloods examined were positive. Of these 303, 148 came from Kingston.

These figures are exclusive of a large number of cases which are diagnosed on clinical symptoms only. As a matter of fact, the number of cases notified during this period is 739. Typhoid is thus very prevalent, and the incidence of this disease raises the question of the advisability of a campaign of protective inoculation in the interest of public health.

(2) *The percentage of Sputa showing the presence of Tubercle Bacilli.*—Of 341 sputa examined for the presence of tubercle bacilli more than 40 per cent. showed the organism—a very uncomfortably high proportion. 485 cases were notified during this period.

(3) *In view of the present interest in venereal diseases* it is noteworthy that of the 428 bloods examined for syphilis by the Wassermann reaction 212 were positive.

JAMAICA LEPER ASYLUM.

It is pleasing to record that much has been done to provide work for the inmates—agricultural pursuits on the farm and general work in the institution. The inmates thus earned a total sum of £210 15s. 4d. The amount paid for farm produce was £108 8s. 4d., and general work—washing, cleaning, &c.—£102 7s.

No serious breaches of the rules have occurred. Few offences of a trivial character were dealt with.

At the beginning of the year there were 108 inmates, sixty-five males and forty-three females. Of this number there were seven male East Indian and one female. There are eight children in the institution under 15 years of age (six boys and two girls).

Leprosy is now a rare disease and the future is very hopeful. The vigilance of the police and the provisions of the Leper Asylum Law are factors in bringing about this desirable result.

During the period under review seventeen were admitted, one being a re-admission, five were discharged under the provision of Law 15 of 1896, and absconded.

The death-rate was 13.6 per cent.

Treatment.—The general consensus of opinion is that in chaulmoogra oil we have the nearest approach to a specific for leprosy, and the form we find here that gives best results in all cases, showing arrest of the disease both in tubercular and anæsthetic forms, is antileprol—a purified form of the oil.

Dr. Caustan of Natal, South Africa, is using stibium, a colloidal antimony. A fair trial, in selected cases, will be given in this institution.

Colonial Medical Reports.—No. 150.—Jamaica (continued)**JUBILEE MATERNITY HOSPITAL, KINGSTON.**

The number of patients admitted during the year was 800; there were eleven deaths, one from accidental hæmorrhage, one from typhoid fever, one from heart failure, one from peritonitis, two from acute nephritis, one from uræmia, and three from cerebral convulsions; 179 were found to have albumin in their urine on admission. The number of infants born was 747, 374 males and 373 females. There were twelve cases of twins and one case of triplets, fifty-eight infants were stillborn; thirty-three of this number had not reached full term and were macerated. Twenty-nine babies died; twenty of these were premature, seven had to be resuscitated and only lived a few hours after birth. One baby was born with alastrim in an advanced stage. The mother had been vaccinated exactly one month before the birth of the child and had never had the disease herself.

The epidemic of alastrim had a disastrous effect on expectant mothers, causing in a number of cases miscarriages; the children born showed the pox marks of alastrim.

LUNATIC ASYLUM.

The number of patients remaining in the asylum on December 31, 1919, was 1,383, of whom 700 were males and 683 females.

The total number of patients under treatment was 1,747, with a daily average of 1,314.6.

The admissions for the year numbered 364, of whom 195 were males and 169 were females. The daily average number of patients is annually increasing.

The number of patients discharged during the twelve months amounted to 134, of whom sixty-six

were males and sixty-eight females; 126 were discharged recovered, seven relieved, and one escaped.

During the year 412 patients died, of whom 214 were males and 198 females. This exceptionally high mortality can be attributed to several causes, viz.:—

(a) The admission of an unfavourable class of patients, some of whom were moribund on arrival, others, owing to age and infirmity, should have been allowed to die in peace in the local poor-house instead of being forced to undergo a long railway journey to hasten the end in the asylum.

(b) In common with the rest of Jamaica, the asylum suffered in the autumn of 1918 from the epidemic of Spanish influenza, and a large percentage of the inmates who suffered from primary pneumonia have since succumbed to pulmonary tuberculosis; ninety-three patients died from this disease during the twelve months.

(c) During the summer months an outbreak of dysentery occurred in the male wards which taxed our infirmary accommodation to the utmost, and although prompt and active measures were taken for its eradication it claimed fifty victims.

(d) Pellagra, a disease of malnutrition, claimed twenty-five victims. This disease cannot be eradicated from our wards as long as beef contractors are permitted to substitute chuck steak and naval stew at 1s. 2d. per lb. for boneless beef of the best description.

Amusements for the patients continue unchanged; cricket, sea-bathing for suitable cases and concerts form our most important methods of entertainment. Many friends and clubs interested in the welfare of the inmates favour us with a supply of magazines and illustrated papers. Doubtless others would assist us with discarded books and papers if they realized the amount of pleasure and mental relief afforded the patients by their perusal.

Colonial Medical Reports.—No. 151.—Jamaica.**ANNUAL REPORT OF THE CENTRAL BOARD OF HEALTH FOR THE YEAR ENDED DECEMBER 31, 1920.**

THE year under review has been practically free from the occurrence of infectious disease, except an epidemic of alastrim or Kaffir milk pox which occurred in Kingston, and subsequently in other parts of the island.

Up to December 31, 1920, 5,142 cases of this disease were reported by the Local Board of Health to the Central Board of Health.

The campaign for the eradication of hookworm still carried out by the Rockefeller Foundation.

During the year a hookworm survey in the parish of St. Catherine was undertaken by the Government under the direction of the Superintending Inspector and the Sanitary Staff. The parish was divided into four areas, each area to be properly

sanitized for the treatment campaign to be undertaken by the Rockefeller Foundation.

THE HOOKWORM CAMPAIGN.*Parish of St. Catherine.*

The town was found to be generally in an insanitary condition, yards being as a rule neglected, damp and dirty from overgrowth of bush, the accumulation of domestic waste, and the wasteful dripping and running of water from service taps. The street drains were badly kept and dirty from stagnant water, and many mud-gutters were foul and grass-grown; one of these within the town I found swarming with *Culex* and *Anopheles* larvae.

Of 238 satisfactory latrines not 5 per cent. were fly-proof; of 727 unsatisfactory, more than 25 per cent. were in a dilapidated condition, and required more or less to be rebuilt, and the pits cleaned. Many of the latrines were of the surface type. Statutory notices were served requiring the construction of sanitary fly-proof pit latrines, and to repair and correct defects; also to clean up insanitary and dirty yards.

The attention of the Commissioner was drawn to other insanitary conditions, especially to the neglected and highly insanitary state of the refuse dump just outside the town. Close attention is required to be paid to the removal, carting and dumping of night soil, which at present takes place without control or supervision, or proper covered carts, or receptacles being provided for the purpose as required by the parish Bye-laws 1 under Sec. 2 of Law 35 of 1910. The Sanitary Staff of the district consisted of one part-time medical officer and one sanitary inspector, whose duties included supervising the scavenging of the town, house to house inspections, and the other ordinary duties of a sanitary inspector. It is quite impossible for one ordinary mortal to undertake all these duties and perform them efficiently. In my opinion two house to house inspectors are required, and an inspector or sanitary foreman to be responsible for scavenging. Some supervision requires to be exercised also over the deposit ground.

Type of Sanitary Latrine installed.—The pit type as recommended by the International Foundation and approved by the Central Board of Health. This consists of an unlined pit 6 ft. deep, with sloping sides to minimize caving in, over which a fly-proof box is fitted; this is set up on a hardwood sill, and has hinged fly-proof covers. A frame or wattle building 5 ft. by 6 ft. is built over the pit on hardwood sills, well away from the edges of the pit, and roofed with palm thatch or zinc set at an incline of from 18 in. to 24 in. The building is well banked and trenched for drainage, and can withstand removal to a new pit when necessary. Construction was undertaken by a contractor who had experience of similar work in Clarendon.

All the schools in the area were found to have insanitary latrines. Steps were taken to have sanitary latrines installed.

JAMAICA HOOKWORM CAMPAIGN.

The office of the campaign was moved from Race Course to Spanish Town on December 1. Treatment, however, under the direction of two dispensing nurses, was continued in the districts of Four Paths and Content. During the month, in these two districts 133 people were treated and ninety-seven cured.

The sanitary work in the Spanish Town area, not having been completed by December 1 as was anticipated, examinations and treatments were given at the Rio Cobre Home and St. Catherine Alms House. At the Rio Cobre Home, sixty-five of the seventy-two inmates were found to be

infected with intestinal parasites, as follows: 32 had hookworms, 13 ascaris, 49 trichocephalus, and 1 was infected with strongyloides. In some cases the same child was found to be infected with three different kinds of parasites. Hamoglobin tests showed a marked anemia in the infected children.

At the Alms House 161 of the 170 inmates were examined; those not examined were suffering from acute illness. Of the ones examined eighty were found to have hookworms. Infection with other parasites was as follows: Ascaris, 31; trichocephalus, 63; strongyloides, 9.

Of 170 persons re-examined after treatment, ninety-seven were found to be cured. 273 persons were treated during the month.

HEALTH DEPARTMENT.

The statistics show that the period under review was not quite as healthy as the preceding year. After deducting from the total deaths, those occurring in the institutions within the parish, there were 134 deaths in excess of the number for the year previous.

Phthisis.—There were 248 notifications; of this number twenty-seven had origin outside the parish.

The death-rate retains its high level of previous years, standing at 4.39 per 1,000; or stated in relation to total deaths, 12.64 per centum.

This high death-rate from phthisis will continue, so long as poverty and overcrowding remain as they are. A high phthisis death-rate is a sure indicator of adverse social conditions, which must be removed before any diminution can take place.

Enteric Fever.—The death-rate from these fevers was 1.59 per 1,000 of population, or 4.50 per centum of total deaths. In 1919 it stood at 4.40 per centum.

This is a high death-rate, and will remain so, so long as the city remains unsewered and crowded with pit-closets, which are more or less in a state of dilapidation, and not fly-proof. The speeding up of the water-closeting of the city is therefore essential and a matter of primary importance. An indispensable preliminary work, such as an adequate water supply, must therefore be taken in hand as soon as possible if the public health is to be safe guarded.

Malaria.—Seventeen deaths were attributed to malaria as against twenty-nine in the previous year.

Anti-malarial work is regularly carried on by the staff. An effort to enlist the assistance of the public in an anti-mosquito campaign has from time to time been attempted.

During the period under review an epidemic of alastrim, lasting to the present time of writing, has taken place.

From May 7 to the date of writing 2,689 cases had been admitted with sixteen deaths. The majority of the cases, even when covered with eruption, showed very little constitutional disturbance. Fifteen inmates are still under treatment.

Being satisfied of the prophylactic powers of

vaccination for this epidemic, I have left no stone unturned to get as many people vaccinated as possible; and have myself done, or caused to be done, 1,213 vaccinations.

In urging vaccination in the vigorous manner pursued, I took the long view that I was, in addition to fighting the spread of alastrim, protecting the community against the introduction of smallpox.

Smallpox introduced into this island would, I contend, be a very serious matter.

It is one of the oldest human scourges. I therefore urge, with all the emphasis at my command, that the population of this country be at once protected by making revaccination compulsory and pressing on with vaccination.

Pellagra.—Twenty-two deaths were attributed to this dietetic disease. Cases not too advanced improve under a well-balanced diet. Drugging is useless, except as a palliative to certain symptoms. The disease is recognized by wasting, nerve symptoms and a very characteristic bilaterally symmetrical skin lesion on exposed parts of the body, such as the backs of the hands and forearms, nape of the neck, and dorsal surface of the feet. In 1919 thirteen deaths were reported.

Pneumonia.—There were eighty-four deaths from this lung disease as against sixty-two in 1919.

All cases of pneumonia must be treated as "suspect."

All unnecessary contact with these cases avoided; and all discharges from the air-passages thoroughly disinfected (as should be done in the case of every infectious disease), protected from flies.

Free ventilation and plenty of sunlight are essential; avoid fatigue and indulgence in alcohol; keep fit at all times; go to bed early and rise early.

Intestinal Inflammations.—These are very prevalent and are notified as colitis (inflammation of the colon or large intestines); gastro-enteritis (inflammation of intestine and stomach); enteritis (inflammation of the small intestine).

Food should be fresh and properly cooked. Flies and their breeding places destroyed. Perfect cleanliness should be observed. All excretions disinfected and guarded from flies.

Veneral Diseases.—These diseases are preventable and curable if taken in hand at once. To do this compulsory notification is necessary. They are, and should be, regarded in the same way as all other dangerous communicable diseases; and the need for making these notifiable is recognized and acted upon.

The ravages of syphilis and gonorrhoea inflict enormous damage upon communities; and these communities are put to great expense in the upkeep of institutions for dealing with the deplorable results of neglect in these matters. Blindness, deafness, insanity and physical wreck and death are directly attributable to these diseases. I need not labour the matter further than to express the hope that in the near future measures for preventing, or, at any rate, for early treatment for all will be forthcoming.

Plague.—In this connection the Department employs a rat-catcher to work along the foreshore to secure specimens of the rat population to be sent up to the pathological laboratory for examination. So far no rats have been found infected with *Bacillus pestis bubonicæ*.

It is hardly necessary for me to say that plague is a disease of rats, transmitted to man by means of the rat flea. 6,000,000 people have died of plague in India in recent years; it has been one of the greatest scourges of mankind from earliest times. It is present in San Juan, Porto Rico, Mexico and Brazil in this hemisphere. It is spread from place to place by shipping. Rats infest ships, become infected at plague ports and as free passengers, carry the disease to other ports. Too much care cannot therefore be exercised in dealing with ships from infected ports. The destruction of rats on ships is a very important and, if properly carried out, very onerous duty, and requires a very painstaking and skilled officer.

Yellow Fever.—This disease is caused by the puncture of the skin by an infected mosquito (*Stegomyia calopus*). Now the *S. calopus* breeds in stagnant water around neglected houses and even in the houses themselves wherever water is left undisturbed, such as in flower pots and lily tubs. In the yard, empty tins, calabashes, sagging gutters, barrels, jars, bottles, hollows in trees—in fact, anything that will hold water. Now the clearing of yards of such materials is clearly the duty of householders and tenants; and no one alive to his own safety would permit the breeding of dangerous insects about his premises.

Could Kingston be by a united effort freed and kept free from *S. calopus*, we need not fear yellow fever; for even if a case were introduced the disease could not spread, because the means of spreading it would be absent.

It has been proved that yellow fever is transmitted only by the puncture of infected *Stegomyia* mosquitoes.

Man is the "reservoir," *Stegomyia* is the insect "carrier." Both are necessary for the spread of this disease.

Flies.—Flies spread disease; they carry disease germs in enormous number in their legs, mouth parts, and millions in their intestines. These germs are deposited on food and milk. Flies visit closets and the excreta of those suffering from infective diseases, and so carry disease to the healthy.

Flies breed in fresh stable manure and decaying vegetable matter; even in closets. Therefore have all manure quickly removed and the ground sprinkled with lime, borax or Jeyes'. Keep all yards perfectly clean. It is far better to prevent the breeding of flies than to kill the adults. By so doing we strike it at the very root of the trouble. A large fly population is an index of a dirty human population.

Flies are responsible for typhoid fever, dysentery and other communicable diseases.

Drinking Water.—I would strongly advise the use of Pasteur Chamberland filters in all homes for

providing drinking water. If not obtainable, *all water* for drinking purposes should be boiled for at least twenty minutes. Contaminated water may cause typhoid fever, diarrhoea, dysenteries and cholera.

Carriers.—A carrier is a person in apparently good health, who, nevertheless, is especially dangerous because he is constantly voiding, in excreta and urine, disease germs. There are carriers of typhoid, dysentery, diphtheria, meningitis and infantile paralysis. Many people are "carriers" of malaria by reason of having malarial parasites in their blood. They act as "reservoirs" from which Anopheline mosquitoes become infected and so convey the disease to healthy people.

I advise the care of and frequent washing of the hands as very important in preventing infection. Also be very careful about the cleansing of the mouth and the proper care of the teeth.

Diphtheria.—There were five cases of diphtheria notified; one death.

The proper treatment of diphtheria is early diagnosis and the prompt administration of antitoxin by a skilled physician. If in doubt do not wait for bacteriological confirmation, but proceed at once with the antitoxin and argue diagnosis afterwards. Speed in the matter is vital.

Alcohol.—Alcohol should only be used in emergencies of short duration. With the exception I have mentioned I know of no good end served by alcohol. It has a very important bearing upon public health questions, and is a cause of crime and acts of violence.

Milk.—With a view to improve the quality of the milk sold, I proposed this year to take samples from the various vendors of milk, have an analysis made (chemically and bacteriologically), and have same published in the Press. Where this method has been adopted the improvement has been marked. The good men are protected and advertised, and the careless and negligent either come up to the mark or go out of business.

HALF-WAY TREE.

The general health of the parish has been only fair.

Influenza of a mild type has been prevalent practically throughout the year; in December several cases of a pretty severe nature occurred in the Liguanea district.

Enteric fever has been more prevalent than in previous years.

I am still of opinion that the chief cause of the spread of enteric fever is the personal factor.

Among the servant class, and in the slum districts, cases of enteric are often not seen by any doctor, or are only seen once, and are therefore not diagnosed. No precautions are taken. It is quite easy to understand how the disease may be spread by visits from friends (other servants, &c.), who

come in contact with the patients and return to their employers, and without washing their hands handle the food, &c., and thus spread the disease.

I would strongly recommend the more general use of antityphoid inoculations as a preventive measure.

Pulmonary Tuberculosis.—I am of opinion that the incidence of pulmonary tuberculosis is increasing.

Ankylostomiasis and yaws are prevalent in the country districts.

Chicken-pox was epidemic during the first quarter. As a matter of fact, chicken-pox and alastrim were both epidemic at the same time.

I have met with no case in anyone who has been recently and properly vaccinated. The cases in children who have been vaccinated in infancy were usually milder than the adult cases. Vaccination is a certain preventive measure against alastrim, which, in my opinion, is a modified form of small-pox.

The portion of the parish adjacent to Kingston consists of a collection of villages or townships built on no regular plan and with no provision for proper streets or drainage.

Water.—House to house supply except in some of the townships near Kingston and the outlying districts, which are supplied by stand pipes or by wells.

Pit closets are practically universal throughout the parish. The larger and more modern houses have water-closets and absorption pits.

The Board passed the following bye-laws in order to prevent insanitary conditions when the water is locked off: "Every owner of premises in which a w.c. and absorption pit is erected shall provide a tank of sufficient size to ensure a constant supply of water."

Veneral diseases are fairly common. Gonorrhœa is most prevalent.

Overcrowding, lack of ventilation, and general insanitary conditions exist practically in all the houses and yards of the poor.

This overcrowding, as a matter of fact, only exists at night. The house is used for sleeping purposes and as a storeroom of the family household goods. During the day the inmates live in the yard. At night they retire into the house to sleep. Every crevice is then stopped up to keep out the night air. I understand that the evil effect of night air arose during the period when malaria was supposed to be caused by "miasma" arising from the soil, especially at night. The chief diseases incidental to and associated with slum life and overcrowding in the country is first and foremost pulmonary tuberculosis.

The ill-ventilated and overcrowded houses of the poor afford every facility for the development and spread of this disease. Enteric fever, veneral diseases and all other infective diseases are also fostered by overcrowding.

Colonial Medical Reports.—No. 151.—Jamaica (continued).**PARISH OF ST. THOMAS.**

Owing to a period of drought during the first few months of the year there was a slight outbreak of colitis due to polluted water. During the latter part of the year malaria was prevalent. The health of the parish, however, can be considered good.

The water is pure but the quantity is limited, especially in the dry seasons.

Overcrowding exists in all the districts.

Veneral diseases are very common, gonorrhœa and tertiary syphilis being the commonest forms met with.

PORT ANTONIO.

The health of the different districts has been good. At no time has the health of the parish been seriously threatened.

The water supply has been good all round. The water has been of good quality.

Night soil is deposited in the sea. All refuse is regularly removed by street sweeping during the early hours of the morning.

Overcrowding exists in some localities, but measures are being taken in giving wholesome advice to those who from ignorance, poverty or otherwise are the chief transgressors.

Veneral diseases are prevalent, especially gonorrhœa.

ANNOTTO BAY.

With the exception of the epidemic of alastrim there has been no unusual sickness during the year.

The water supply of the town of Annotto Bay is obtained from a spring which rises out of the ground on Fort George, about three and a half miles from the town. The water is quite pure and an excellent drinking water. The water obtained from the rivers and streams is subject to every kind of pollution.

In the town of Annotto Bay the bucket system is in use. The sanitary men work from 10 p.m. until 4 a.m. Buckets are collected twice a week and clean ones put in their place. The used buckets are carried to the dumping ground, washed in a tank provided for the purpose, and rinsed in a solution of Jeyes'. At the hospital and all the public buildings the buckets are changed every night.

The dumping ground for Annotto Bay is situated about half a mile out of the town. Here pits are dug and the buckets emptied into them, and as soon as the dumped material reaches to within 3 ft. of the top the hole is filled in. Owing to the low level of the land, the clay soil and the almost complete absence of drainage, these pits become filled with water in heavy weather, and then it becomes necessary to empty the buckets into the sea.

During the year the seasons were remarkable for their mildness, the rainfall for both the May and October seasons being unusually small. In consequence, the amount of sickness in the autumn was much less than is generally encountered at that time of the year.

The epidemic of alastrim started in the Annotto Bay district in August last year and lasted until December 31, 1920. There have been altogether 107 cases of alastrim seen and notified in the Annotto Bay district.

PORT MARIA.

Prevalence of Sickness in Different Seasons.—It has always been gratifying to me to record the gradual lessening in incident of malarial fevers in this district for the past eight years, but it is with equal regret that I have to report the unusual prevalence of this disease during the period under review. In all 261 cases were admitted to hospital, and very many more were treated in private practice. The disease was also unusually severe, and many malignant cases were seen which accounted for a few deaths. During the severe drought many of the smaller rivers and springs ran dry, and when it did break in November, instead of the usual heavy downpour which would have caused a general flushing out, only intermittent showers fell, which filled up trenches, pools, &c., and the anophelines did the rest.

The water supply of Port Maria and its environs is the same as previously reported.

There is no change in the disposal of waste matter.

The bucket system established in 1914 is still in use, and is giving good results.

The relative mortality in the different seasons is impossible to arrive at, but the general mortality rate was not high.

The year was marked by a long and unprecedented drought, the rainfall for the whole year hardly equalling that of one month in ordinary times.

The outstanding feature of the year has been the outbreak of alastrim. Fifty-five cases were admitted. There have been no deaths. The disease did not assume epidemic form.

Now whatever the differences of opinion may be, I think I am safe in saying that the consensus of opinion of the medical men in Jamaica is that vaccination is as effective against alastrim as it is against smallpox.

Veneral diseases are still very prevalent, though the number of cases of syphilis seen was not as many as in the preceding year.

During the summer of the year there was an outbreak of dysentery, and the alastrim epidemic occurred in the latter part of the year.

During the outbreak of dysentery and alastrim Jeyes' fluid was supplied freely to all the houses that were affected, and fumigation was carried out in almost all the homes that would admit of fumigation.

The outbreak of dysentery accounted for an increase in the death-rate. About eighty to one hundred persons suffered from it.

The extent to which overcrowding exists is alarming; the people seem to have very little gift of trying to improve their sanitary conditions.

Gonorrhœa is very common.

ST. ANN'S BAY.

The diseases encountered during the period under review were typhoid fever, malaria, bronchial troubles and alastrim. All of these were of a mild type and not confined to any particular part of the year, except alastrim, which started in September, and was still in existence at the end of the period under review.

In the towns sanitary conditions have greatly improved, but in the villages and country parts this is still lacking.

In the Ocho Rios district, with the exception of twelve houses, all other residents on the sea front are without any description of latrines, using the sea for the deposit of their excreta.

On the southern side of the town, as well as in the country parts of this district, while attempts have been made to improve the latrine conveniences of the homes, the major portion of the inhabitants elect the stone holes as the depository of their excreta instead of building latrines. The major portion of the entire latrine system of the district is exposed to beasts and birds.

St. Ann's Bay District.—In the country parts there are a few pit latrines, but the vast bulk of the inhabitants use the surface latrines, and many homes are without latrines. Nearly all the latrines are accessible to beasts and birds.

Alastrim was evidently imported. The spread was mainly due to overcrowding and ignorance. Disease is looked upon by the peasants as "God's sickness." They therefore consider the taking of precaution unnecessary. Unless the masses be properly educated and sanitation taught in the schoolroom and from the pulpit, assisted by the whole-time sanitary inspectors and health officers, we need not hope for much improvement along this line.

CLAREMONT.

Except for alastrim, there was no unusual amount of sickness. The period of greatest incidence of infective diseases was from October to December, November being the highest.

Source of water supply, chiefly tanks, except in the neighbourhood of "Rio Ho" near Moneague, and Pedro River. Sufficient in the rainy seasons, but markedly deficient in any dry weather, at which times the majority of the poorer people take their supply from ponds. Purity is fair for tanks; low for ponds and rivers. Some tanks protected by wire netting, other sources unprotected.

Mortality.—Greatest in November and December, chief increase being in "vomiting sickness."

Above-mentioned period accompanied by heavy rains.

BROWN'S TOWN.

Prevalence of sickness during the different seasons of the year has been normal, except as regards Kaffir pox, which appeared towards the end of August last, and exists still.

Water Supply from Tanks.—Public and private, ponds, rivers and springs. Quantity insufficient, particularly during periods of drought. Purity, good; remotely liable to pollution in the case of tanks, but very liable in the case of ponds and rivers. Protection only applies to tanks.

Mortality has been low, except during dysentery outbreak in October and November.

Infective Diseases.—Dysentery, fifty cases; about ten deaths. Kaffir pox, 200 cases; one death. Kaffir pox spread somewhat widely.

There is overcrowding, which is particularly apparent when there is an outbreak of disease. No attempt is made to improve the condition.

Veneral disease is fairly common, chiefly syphilis and gonorrhœa.

DUNCAN'S MEDICAL DISTRICT.

The year under review has been one of the most unhealthy in my experience. Typhoid fever of a severe type broke out in June, and cases continued to occur until the end of the year. The epidemic of ackee poisoning was also the worst that I have seen, although its duration was a short one—about six weeks from January to the third week in February.

The water source is from ponds chiefly; in two cases rivers; in one, spring.

Quantity.—Plentiful in rainy weather; the reverse in droughts.

Purity.—All ponds liable to pollution from cattle, &c.

During January and the first half of February heavy and continuous rains fell. These caused a more or less rapid decomposition of the ackee, which, in my opinion, was the cause of the large number of cases of ackee poisoning that occurred during this period.

About forty cases of typhoid fever occurred from June to the end of the year with about nine deaths.

Overcrowding exists everywhere, especially amongst the poorer classes. This, in my opinion, is one of the worst features in Jamaica.

Veneral diseases are prevalent. Gonorrhœa is the most common.

ULSTER SPRING.

With the exception of the alastrim, which made its appearance here in the month of October, and a number of cases of enteric fever and vomiting sick-

ness occurring between that month and December, the year was uneventful. The alastrim affected adults much more severely than children. The cases of enteric fever, not severe, only a few ended fatally, and these were complicated with septic pneumonia and meningitis. Of the cases suffering from vomiting sickness only a few died.

Water obtained from springs and wells is abundant, but liable to pollution from surface drainage, and is unprotected, with the exception of dam in connection with hospital.

The mortality in the different seasons compare favourably. The rate a little higher than the previous year, due perhaps to an increased number of cases of ecchitis, enteric fever and vomiting sickness. The prevalence of flies during the summer months seems to have been responsible for the ecchitis occurring during that season.

MORTEGO BAY.

During the latter part of winter and early spring malaria was quite prevalent, also frequent attacks of influenza, bronchitis and a few cases of pneumonia. In the summer months malaria still prevailed, also several cases of typhoid fever were noted.

Inflammatory conditions of the nose and throat were especially common.

The fall and winter were especially marked by the epidemic of alastrim.

The source of the water supply is rivers and springs. There is a sufficient quantity of good quality, but liable to pollution in some cases.

During the winter and spring months enteric fever, pneumonia and pulmonary tuberculosis were chiefly responsible for the mortality.

During the year the characteristics endemic have blossomed forth in their respective seasons and subsided. I mean malaria, measles, pneumonia, varicella, influenza benignans, infective conjunctivitis (non-gonococcal), enterocolitis, &c. I must mention just here that I fail to see the reason why such a deadly infectious disease as pneumonia should be proscribed from the list of notifiable diseases, and almost the harmless exanthem varicella substituted in its stead, for even though it might have been surmised perhaps that the Central Board of Health was sceptical as to the ability of the younger medicos of Jamaica to differentiate between varicella and variola modified and attenuated by vaccinia, I am of the opinion that pneumonia should never have been deleted from the list of notifiables; one has but to think of the infectiousness of this malady, its predilection for the strong and vigorous, and its rapid progress to death or recovery, or the long suffering from superinduced complications, the chief of which are pulmonary tuberculosis and pleurothorax. I strongly recommend the establishment and maintenance of a proper isolation hospital with special

wards for pulmonary tuberculosis, pneumonia, typhoid, variola or alastrim, bubonic plague, &c.

It is a terrible thing for any member of the medical fraternity in his earnest endeavour to discharge the duties of his office efficiently and well to be handicapped all the while by the indifference and non-appreciation of the Local Board of Health, who, like self-willed children, are deaf to everything scientific and helpful for the welfare of humanity, remain obtusely oblivious of some pending calamity which might encompass their neighbours and themselves in one common ruin.

This important town of Montego Bay, which is getting bigger every year, has been justly regarded as the metropolis of North-Western Jamaica, still remains in darkness (save on nights of moonlight), is devoid of sewerage system, and as such is not at all attractive or sanitary save for the sea's proximity.

LUCEA.

Malaria fever was common during the year, especially in the Green Island district.

There are two reservoirs situated at Haughton Court, about two miles distant, which supplies the town of Lucea with drinking water. The supply this year has been plentiful owing to good seasons, and the quality of the water is good. Other villages are supplied by springs, rivers or wells. There are numerous wells all over the town of Lucea. Some are protected by a covering. There is a tank at Upper Hopewell. Waste matter is disposed of by filling up swampy lands or thrown into the sea. The street sweepings are used to fill up swampy lands. There are no dumping grounds.

The latrines are of the pit, bucket or surface kind. Some of the residences have the water carriage system, but are practically useless, as the owners will not keep them in proper repair and working order. Some latrines are fly-proof and protected, while others are not so. Some buildings have no latrines at all; in fact, there is no land around the houses on which latrines could be erected.

From the end of September, 1920, to December 31, 1920, there was an outbreak of alastrim or Kaffir pox. It has affected all parts of the parish.

Overcrowding exists among the poorer classes, and venereal disease and gonorrhoea and their sequel are common in the parish.

SAVANNA-LA-MAR.

The earlier part of this season being quite dry the districts were comparatively free of malaria. On the other hand, diseases of the upper respiratory tract were quite in evidence on account of the dust. A large number of the population suffer great inconvenience and probably pecuniary loss from such maladies as "sore throat," "nasal catarrh," and not the least among them pulmonary tuberculosis,

directly attributable to the large amount of dust they unwillingly inhale during the year.

The water supply is derived from small streams. These are not protected from pollution and so constitute potential sources of water-borne epidemics.

Sav-la-Mar is supplied by the Carawina River, six miles away, the water being conveyed down by water-pipes. The bacterial analyses show constant pollution. The people are advised to boil the water used for drinking purposes.

In Sav-la-Mar the waste matter is used to fill up the marshy lands around the town.

All households in the town proper have sanitary conveniences. Those situated in the shum areas possess no such conveniences. The great majority of the latrines are of the surface type, accessible to flies, fowls, &c.

Kaffir Pox.—This disease, also known as alastrim, arrived during the latter part of August. Routine treatment kept down its spread.

Veneral diseases are prevalent, particularly so in the town. Gonorrhoea is the most common.

LAMB'S RIVER.

The health of the district was on the whole very satisfactory. There was a small outbreak of enteric fever in the York section. Malaria did not show its usual seasonal incidence in the rainy months.

Water Supply.—Quantity sufficient, liable to pollution, protected in a few cases.

During the months of August and September there was a small outbreak of enteric fever.

GRANGE HILL.

Beyond the usual amount of malaria fever there has been no prevalence of illness.

Two cases of enteric fever occurred, and eighteen cases of alastrim were seen and treated.

A better water supply is needed. The supply remains unchanged; it is by wells only, and liable to pollution.

The mortality has not been affected by the different seasons, and the death-rate has not been high.

The rainfall has been very heavy. Puddles for the propagation of the mosquito have been created, and malaria, as usual, has been fairly prevalent.

The people are educated in the principles of sanitation when the opportunity affords an opening.

SANTA CRUZ DISTRICT.

The epidemic of alastrim first appeared at the end of July. The Pedro Plains district was next attacked, and here conditions were difficult.

Typhoid fever has not been prevalent. The drought swept malaria fever from the Pedro Plains as there were no breeding places for the Anophles.

Veneral disease has been very prevalent, but

the people are realizing the seriousness of this type of disease and taking treatment.

MANDEVILLE.

In July, 1920, a case of eruptive fever which was quite unlike the ordinary chicken-pox occurred in the district of Newport; measures of isolation and vaccination of all contacts were adopted, and the disease was reported as a case of smallpox. This diagnosis was not accepted, and was therefore amended to chicken-pox by the Central Board, who at the same time stated that isolation did not appear necessary.

This view of the disease was accepted by many with disastrous consequence to the people of the parish and the whole island. The disease, subsequently termed alastrim or Kaffir pox, soon invaded the whole parish, as no means were adopted to prevent infected persons from leaving Kingston. These infected persons came into the parish through every channel of communication, and in a short time the disease was widespread. The epidemic has raged since July with no tendency either to its sudden or gradual disappearance, as no sooner a district has been declared free of the disease than new cases will occur. The disease has been the cause of great suffering among the afflicted ones, and the scars in many show no tendency to disappear after six months. Having no isolation hospital in the parish and as temporary hospitals could not be established on account of the scarcity of water at the height of the epidemic, isolation and treatment had to be done in the homes. These measures have been fairly successful.

Measles have been prevalent throughout the parish since March, 1920.

During the months of June, July and August, colitis was a common trouble, and I attribute flies as the possible means of conveying the infection.

Dysentery was epidemic in the districts around Madstone in December, 1920, January and February, 1921, and the outbreak was no doubt due to the use of polluted water from ponds. The drought was very severe in those districts, and the people either had to use soupy water from the local ponds or to undertake a long journey to a spring in an adjoining parish.

Mandeville.—The town is now in a fairly good sanitary condition, and the water carriage system where established has worked well, otherwise the bucket system is employed.

Christiana.—Although this township is cleaner and the storm water carried off by covered drains, the open surface latrines are still a menace to the health of the community. Properly constructed pit closets will remedy the evil.

Porus.—In dry weather the sanitary conditions of this town are not unfavourable, but during the wet seasons the open surface latrines are swamps of filth. There are very few sanitary arrangements in the villages, and all are of the open surface latrine type.

Colonial Medical Reports.—No. 151.—Jamaica (continued).

The reservoirs of Battersea and Porus furnish a good water supply, and frequent analyses of these waters show the absence of any pollution, but the amount of water stored in the reservoirs at Battersea is not sufficient for the requirements of a town of importance like Mandeville.

Tuberculosis.—This disease is unfortunately on the increase, and will continue to do so as long as the people have to live in wretchedly overcrowded houses with no ventilation, which is the general rule in the country parts and in tenement houses about the towns and villages. No attempt has yet been made to instruct the people or children in the principles of sanitation.

Syphilis and gonorrhœa very common and increasing, and to be seen in every stage of the disease.

RACE COURSE P.O.

In my last report I referred to the inadequate provision made for public water supplies in this dry area, and I referred to the case of the village of Hayes. This is a large and scattered village with a population of about 1,000, and the inhabitants suffer continually from a water famine, as there is only one public well, which is 100 ft. deep, and from which water is drawn by a bucket and windlass. All day long all sorts of vessels are lowered into it, and some of these vessels must come from homes in which contagious disease exists. It is obvious that a supply of this kind for a village of the size is totally inadequate, and that personal and domestic hygiene in the village must be carried out with considerable difficulty. Without adequate water supplies there can be no question of promoting even elementary domestic hygiene.

A small number of modern sanitary conveniences has been introduced into the houses of the well-to-do, and these are giving satisfactory service.

The most notable sanitary improvements have been the introduction of latrines throughout the district.

Overcrowding is very common, and the housing conditions in many of the villages are deplorable.

Veneral diseases are extremely prevalent. Gonorrhœa is prevalent among young adults, especially on the estates; its widespread incidence is one of the most important causes of invalidism at work among the female population of the island.

MAY PEN.

The different seasons were not marked by any prevailing disease. A fair amount of bronchial affections came under my notice, due, in my opinion, to the dust arising from increased traffic on the roads. The year was particularly dry. The usual May and October rains fell very short of the average.

Water Supply.—This remains the same as in my last report. There has been no improvement with

regard to the source, quantity available, purity, &c. Street sweepings and refuse from the yards and compounds are removed with a hand cart to a deposit ground and burnt.

Night soil from the Poor House and from the yards of those of the inhabitants who use the bucket system are removed to a deposit ground and buried. A septic tank is now in course of erection at the Poor House, which will be a great sanitary improvement.

All the premises in the town of May Pen have been provided with latrines, the type being of the pit system. The pit system is being compulsorily installed in all the villages of the plains. These are flyproof and are not accessible to bird or beast.

During the month of August there was an outbreak of alastrim, two cases occurring in the immediate vicinity of the town. Seventy-one cases were reported with one death.

SPANISH TOWN.

The health of the district was on the whole satisfactory. Malaria was prevalent during the rainy months, and during the month of March of this year a number of cases of measles came under my observation.

The water supply of Spanish Town is usually inadequate for supplying the town. The supply in the outlying districts is from tanks and ponds.

In the town, collection of house refuse and street sweepings are removed by the sanitary carts to the deposit ground, which is situated over a mile from the town. Night soil is removed by carts to the dumping ground and deposited.

Mortality was at no time very high among adults; infantile mortality, however, too high to be regarded with indifference, the chief cause of which, in my opinion, was from malnutrition.

Overcrowding exists in the tenement houses and poorer parts of the town. The houses are small and ill-constructed. It also exists in the country parts.

Veneral diseases are prevalent.

OLD HARBOUR.

The only disease which has been unusual is alastrim. There has been no fatality to record. The cases have been generally mild and no sequelæ or complications appeared so far.

Water Supply.—There has been much difficulty in certain areas, e.g., Church Pen and Old Harbour Bay practically are very often without water at all, whilst the outlying portions of Old Harbour sometimes have difficulty in securing sufficient.

Pollution is possible, the cause being that it is an open stream running down to the reservoir.

Waste Matter.—Carts remove this to a dumping ground outside of Old Harbour. Night soil is buried in the neighbourhood of closets unless it be the pit system.

Veneral Diseases.—Common. Syphilis most common.

Colonial Medical Reports.—No. 152.—Egypt.

ANNUAL REPORT FOR 1920 OF THE MINISTRY OF THE INTERIOR, EGYPT.

INTRODUCTORY NOTE.

THE conversations between Lord Milner's Commission and the Egyptian Delegation on the question of Egyptian independence and the administrative modifications which may result therefrom have introduced an element of uncertainty into the choice of fresh lines of public health advancement. In view of this and pending a reorganization of the Department it has been thought advisable during the past year to limit the activities of the Administration to consolidation of the public health advances already made and to leave the adoption of future lines of progress to a time when it will be possible with greater certainty to initiate fresh developments in accordance with the subsequent definition of future policy.

During the past year, however, two questions of a pressing nature, which could be settled without prejudice to any future policy of the Department, urgently called for fresh legislation. The requirements of the first of these were met by the introduction of a new law giving greater powers of dealing with unqualified dental practice which was gradually becoming a serious public danger. The penalties under the old law afforded an insufficient deterrent to a gradually increasing horde of ignorant charlatans who found in the practice of dentistry a lucrative source of gain, and in February of last year the new law, which had been in preparation for some time, was promulgated. In introducing this law, it was felt that as a matter of justice some distinction should be drawn in favour of those unqualified practitioners who through long practice had acquired a certain empirical knowledge of the art. To remove suddenly what had previously been an accepted means of livelihood would have entailed a considerable hardship upon many individuals whose claims to dental knowledge were sufficiently justified to remove them from the category of those who constituted an actual danger to the public. To avoid this, certain transitory clauses were added to the law which provided for the grant of a modified form of permit to such as were able to prove that they had been actually in continuous practice as dentists for a period of at least ten years before the date of promulgation of the law and who could sufficiently justify their claims to be allowed to practise their art by passing a special examination held by a board of examiners constituted for this purpose. Considerable difficulty was experienced in deciding upon the claims submitted with regard to length of practice, and in many cases the Committee formed to inquire into these was placed in the position of having to view with considerable suspicion some of the documentary evidence submitted. There were finally admitted to the technical examination 218

candidates. Of these, 193 were able to satisfy the examiners that they were in possession of sufficient practical knowledge to justify permission being given to them to continue their calling, whilst twenty-five were unable to satisfy the examiners.

The second question which in 1920 called for special legislation first came up for consideration in the summer of the previous year when it was reported to the Department that a soldier of the British Army had contracted anthrax as a result of the use of an infected shaving brush. Inquiries were made and the origin of the brush was traced to a consignment which had been recently imported into the country from Kobe in Japan. Samples of brushes from the consignment were examined in the laboratories and were found to be infected with anthrax. As there were in existence no powers under which such brushes could be condemned or otherwise dealt with they were purchased from the consignee and destroyed. Attempts were also made to trace a certain number of brushes which had formed part of this consignment and which had already been sold. A large proportion of these were also subsequently traced and destroyed. In view of the marked infection which was found in the course of the examination of the consignment in question, it was considered advisable that further inquiry should be made into the whole question of the possibility of danger arising from similarly infected importation. Pending the result of this investigation the Customs Administration was requested to hold up all consignments of shaving brushes arriving in the country until the Public Health Department had had an opportunity of satisfying itself as regards each that no danger of infection existed. Specimens at the rate of 10 per cent. in the case of the Japanese brushes and 5 per cent. in the case of other brushes were taken from each consignment for bacteriological examination and no consignment was passed unless it showed absolute freedom from infection. The Public was at the same time informed through the Press of the danger of infection from shaving brushes and were advised before using new shaving brushes to submit these to a process of disinfection, of which the details were given, with the object of reducing the danger. As the result of the investigation it became apparent that a very serious risk of infection from imported Japanese shaving brushes existed and with the assistance of the International Quarantine Board steps were taken to deal with the danger provisionally, pending the introduction of special legislation directed to this end. The necessity of dealing with brushes arriving from Japan *via* other countries had to be taken into account. On May 29, Law No. 21 of 1920 was promulgated forbidding the admission

to this country of all shaving brushes unless accompanied by certificates of disinfection from the competent authority in the country of manufacture. The powers under the law were further amplified by an *arrêté* of the Ministry of the Interior dated June 7, 1920, which gave powers to deal with brushes found infected after introduction into the country.

During the year the task of reorganizing the work performed by the Public Health Administration under the law dealing with Unhealthy, Inconvenient and Dangerous Establishments was continued and a complete revision of the Health Division of the Schedule of the establishments dealt with under this law was undertaken. The scope of the control of these establishments by frequent inspection was also extended and five additional posts of Inspector for this work were created in the 1920-21 budget. As a result of the more prosperous and settled condition of the country and also in part owing to some fall in the cost of buildings, the number of applicants for fresh licences under the law has largely increased.

With the cessation of hostilities and the relatively greater facility for obtaining labour as a result thereof, the work of filling in or draining ponds of stagnant water and marshes which constituted a danger to public health was again actively taken up and has progressed considerably during the past year.

It is to be recorded with considerable satisfaction as a favourable indication of an increasing public interest in the provision of hospital treatment for the poor that during the year several notables have interested themselves in collecting funds and have personally very generously given donations of money and land for the building and upkeep of new hospitals. Owing to the high cost of building it has been found difficult to take immediate advantage of their generosity, but it is to be greatly hoped that in the near future, when a more satisfactory expenditure of the money provided becomes possible, a full use may be made of this for the provision of further hospitals, inasmuch as the existing hospitals are absolutely inadequate in number and size for the needs of the population. The requirements of the country call for a large general hospital in each mudfria and a cottage hospital in each markaz. It can, however, scarcely reasonably be expected that the cost of these should be altogether provided out of the funds of the State, and it is the policy of the Public Health Administration to encourage in every way the building and endowment of hospitals by private individuals.

A proposition has been put forward to open a small maternity out-patient department and school of midwifery at Qasr el 'Aini Hospital so that more practically trained midwives may be available for the poorer women in Cairo than is the case at present. It is to be noted that there is no maternity hospital in Cairo. That the need of one is pressing no one can doubt.

The general programme of hospital building is considerably behind. New hospitals that should have been completed in 1919 have not even been commenced and extensions that are urgently required have not yet been put in hand.

With the disappearance of the necessity for the

provision of hospital accommodation in Government hospitals for military patients, there has been a reduction in the number of in-patients. But against this there has been a considerable increase in the number of out-patients dealt with. There was a considerable increase in 1920 in the number of major operations as compared with the previous year, there having been 12,797 in the former year as against 9,051 in 1919.

There was also a considerable increase in the cost of maintenance in the year under report, it having risen in that year to L.E. 230,612 as compared with L.E. 183,141 in 1919. The average cost of upkeep per bed during the year was L.E. 56'370 milliemes whilst the average cost per patient-day was 246 milliemes. Hospital receipts in 1920 were only L.E. 15,938'012 milliemes as compared with L.E. 18,097'193 milliemes in 1919.

Special anthelmintic annexes similar to that attached to Qasr el 'Aini Hospital at the end of 1919 were established in connection with the Qalyûb, Benha and Mansûra General Hospitals for the free treatment of out-patient suffering from ankylostoma, bilharzia, and other worm infections. This is intended to form part of a general campaign against ankylostoma and bilharzia in this country and it is hoped that during the coming year similar treatment centres may be attached to other provincial hospitals. The number of out-patients treated since the opening of these annexes is 14,905. Of these, 1,905 were patients infected with ankylostoma and 13,000 with bilharzia.

The seven schools for training native midwives in the provincial towns continued to do good work and remained open the entire year.

The thirteen Children's dispensaries worked continuously through the year except that of Asyût, which was closed on the ground of lack of funds.

In connection with infectious disease generally there is but little to record in 1920. During the whole year the position was highly favourable, the disease incidence in every case being exceptionally low. The reduction in the incidence as compared with 1919 was in some cases considerable, being 60 per cent. in the case of smallpox and 48 per cent. in the case of plague. The diminution was 22 per cent. in the case of typhus and 12 per cent. in the relapsing fever incidence.

One case of cholera occurred at Suez in the summer. Exhaustive inquiry in this case failed to establish the source of infection. The necessary precautions were taken and no further cases developed.

During the year there was a slight rise in the number of cases of malaria recorded as compared with last year. The increase was due to the larger number of cases reported from the province of Aswân and was in large measure probably due to the better notification of cases as a result of the attention drawn to this by the epidemic which occurred at Dirr in the previous year. There was no recrudescence of the disease at Dirr. In the infected area steps have been taken to fill in dangerous *birkas* and during the autumn to stock wells with fish. A small

outbreak occurred at Aswân Dam in the month of June in which twelve cases were notified. This was found to be due to some marshy ground in the gardens of the Public Works Ministry on the east bank. The ground was filled in and the epidemic ceased. The anti-malaria work of the Anti-Malaria Commission was continued during the year. Dead-end canals and railway borrow pits at Zagazig were suppressed and *birkas* were filled in at Mansûra, Minûf, Fuwa, and Ashmûn. In the Oasis of Siwa the drainage system has been entirely re-modelled and improved. In Kharga, agricultural experiments to discover a substitute for the rice crop have been continued. In Helwân, wells have been covered and small improvements have been made in the Gezira drainage scheme. In the Canal area the bank which had previously been made in the lake at Kantara for the purpose of drying off the ground to the west of the railway station was greatly strengthened.

During the year, 34,173 passengers and immigrants from countries infected with cholera landed in Egypt. Measures of control and observation at their destinations were applied to 33,578 of these. No cholera infection showed itself in the case of any of the passengers under observation. Land passengers from Palestine during the year were similarly controlled for all diseases.

Owing to the continued shipping difficulty the Government was compelled to charter a steamer for the transport of the Egyptians proceeding on the pilgrimage to Mecca. The number of pilgrims was 1,658 in addition to the Mahmal escort and staff which numbered 507.

VITAL STATISTICS AND REGISTRATION OF BIRTHS AND DEATHS.

Vital Statistics.—The birth-rate for 1920 (42·8 per thousand) was appreciably higher than that for 1919 (38 per thousand), whilst the death-rate was appreciably lower (28·3 per thousand in 1920 as against 30 per thousand in 1919).

Registration of Births and Deaths.—Considerable inconvenience having at times resulted in the past from occasional losses of births and deaths registers, the question was studied with a view to providing for greater security of such valuable records. A set of regulations was drawn up and issued as Departmental Order No. 21 of March 11, 1920. These instructions cover the issue, handing over, and final disposal of births and deaths registers. The principal innovation embodied in these instructions is a provision for registers being renewed every two years. In order to give effect to this, the registers have been remodelled, and issued in different sizes, suited to the various registration areas.

It is interesting to note that reports of losses of registers have been less frequent since the issue of these instructions than they were previously.

INCONVENIENT, UNHEALTHY, AND DANGEROUS ESTABLISHMENTS.

During the year 1920 the task of reorganizing the work performed by the Public Health Administration

under the law dealing with *Etablissements incommodes, insalubres ou dangereux* was continued.

Revision of Schedule.

The most important step was the complete revision of the health division of the schedule of establishments dealt with under this law.

The grouping of the establishments in the old schedule was most unsatisfactory. For example, any establishment where the machinery was driven by a mechanical motor of any sort came automatically into the first class irrespective of its importance as regards public health.

In the revised schedule an attempt has been made to group the establishments into the three classes in accordance with their importance from a public health point of view.

The new schedule was issued by an *arrêté* of the Ministry of the Interior dated May 31, 1920, which was communicated to the units of the Administration by Departmental Order No. 48, dated July 7, 1920.

Revision and Reprint of "Model Conditions."

During the year the volume of "Model Conditions" was revised, added to and reprinted. An attempt has been made to make this publication a real "hand-book" on all questions concerning this law. The volume now contains: (1) The text of the law itself; (2) the *Arrêté* of August 29, 1904, giving the general regulations for applying the law; (3) the revised health schedule of establishments; (4) the list of towns and villages in which establishments in Category B are licensed; (5) all the most important Departmental Orders concerning the application of the law; and (6) model conditions for fifty-eight different types of establishments.

Appointment of Inspectors.

Five new posts of *Etablissement insalubres* inspectors were obtained in the 1920-1921 budget. These men were trained for three months at Cairo City Inspectorate, and were then posted to Benha, Beni Suef, Faiyum, Qena, and Sohâg.

Four posts of foreman at Cairo City Inspectorate and one post of foreman at Port Said were converted into posts of inspectors in the same budget. All these posts were filled by men after training at Cairo.

A post of chief inspector of *Etablissement insalubres* was also obtained by conversion of another post at Cairo City Inspectorate. The holder of this post is the senior inspector, and it is proposed to leave him at Cairo City Inspectorate until the requisite number of inspectors have been trained by him. When this is accomplished, he will be attached to Section 1 at the Central Administration, and will be used for inspection of the work of the provincial inspectors under the orders of the Director of the Section. There are now eighteen inspectors of *Etablissements insalubres* at work.

To complete the programme, six more inspectors are required, giving a total of twenty-four.

Colonial Medical Reports.—No. 152.—Egypt (continued).*New Instructions re Plans.*

The instructions which are given to applicants for licences telling them how their plans should be drawn up, what should be shown on the plan, &c., were found to require revision.

This has now been done with the help of the chief sanitary engineer of the Administration as follows:—

Proper latrine accommodation must be provided for the workpeople. If women are employed, in addition to men, separate latrines must be provided for them; the entrance to the men's latrine must be remote from the entrance to the women's latrine.

Latrines must be entirely outside, and should be situated to the south of the main buildings of the establishment; they must be so placed and arranged that each separate latrine may have an opening for light and ventilation in addition to the door.

Wherever possible, latrines must be water closets, drained to a proper settling tank, from which an overflow pipe discharges to a percolating pit.

All drains, manholes, settling tanks, cesspits, &c., must be situated in unroofed areas. Cesspits, &c., must be covered with airtight movable manhole covers, and must be ventilated by special ventilating pipes carried up above surrounding buildings.

Where no water supply exists the latrines may be:—

(a) Pail latrines, in which case the pails must be frequently emptied and cleaned.

(b) Built immediately over a fosse, of which the width must not exceed one metre.

An access manhole with an airtight cover must be provided to the fosse for emptying and cleaning. The walls of the fosse must be watertight, but the bottom should be percolating.

In both cases (a) and (b) the latrines must be situated in special buildings entirely separate from any other building.

No cesspits, &c., will be permitted under or inside any of the buildings.

It is important that the plans and sections should conform to these requirements, and should also show that all the special conditions laid down for the particular establishment in question, are complied with.

Work done during Year.

Owing to the prosperous condition of the country, and also owing to the fall in the prices of building materials, the number of applicants for licences has very largely increased.

The total number of ministerial *arrêtés*, laying down additional conditions to improve the sanitary state of various existing establishments, which were approved by the Administration during 1920, was ninety, as compared with seventy-nine in 1919.

The medical officers and inspectors are instructed only to use a ministerial *arrêté* as a last resort, and always to try to persuade the owner of an establish-

ment requiring repairs or alterations to carry these out of his own free will without using the machinery of the law to force him to do so.

In the great majority of cases, their powers of persuasion are successful, but there always remains a small minority of recalcitrant owners who refuse to spend the necessary money unless forced to do so by law. These are the ones who are dealt with by the ministerial *arrêtés*.

The appointment of the *Etablissements insalubres* inspectors has had a very beneficial effect on this portion of the work and in some towns and districts the condition of the establishments as a whole already shows a very marked improvement. Port Said is a good example of this. The personality and keenness of the inspectors has of course a great influence on the rapidity with which this improvement shows itself.

The appointment of a chief inspector at the Central Administration will, it is hoped, be of great use in unifying the effort and by constant inspections of the work of the inspectors in weeding out those who for any reason are not suitable for this type of post.

New Statistical Table.

A new statistical table has been added to the report this year showing the numbers of all types of establishments licensed under the Health Division of the schedule of the *Etablissements insalubres* law in the whole of Egypt.

It must not be presumed that this table is absolutely accurate, as there are probably still many licensed establishments which are not yet shown in the *Etablissements insalubres* registers. The compilation of these registers was very difficult, as the only records from which they could be filled in were from old registers kept in the *mudiriya*s or governorates in which the records of *sahha* establishments and *zapt* establishments were mixed together.

However, by means of inspection it is becoming gradually possible to locate and register all licensed establishments and to compel those without licences to apply for them. In a very few years' time it is hoped that this table will show the position absolutely accurately.

One of the chief objects of this register is that the Director may be able to follow the course of each application and prevent avoidable delays occurring. In 1918 the average period taken between the date of application and the date of approval or refusal was eighty-eight days. In 1919 it rose to one hundred and seventeen, while in 1920 we succeeded in lowering it to seventy days.

It should be noted that the chief cause of delay is due to the fact that applicants very often do not submit accurate or properly drawn up plans of their establishments and their plans have to be returned, and often more than once, for completion. It is hoped that with the issue of the revised instructions concerning the drawing up of plans for new establishments this cause of delay will be reduced considerably.

New Cemeteries and Cemetery Extensions.—The

number of cemeteries newly created or enlarged during 1920 was not great. This is chiefly due to the fact that the inhabitants applying for the establishment or the enlargement of a cemetery are reluctant to pay the price of the land required for this purpose.

A large increase in the number of new cemeteries and extensions is, however, expected in the near future, as a considerable number of applications are now under consideration.

Encroachments on Cemetery Land.—These are still very frequent.

As already stated in the report for 1919, in the majority of cases, the encroachments are due to the cemeteries being very old, to the absence of pillars to mark their boundaries from the surrounding land, and to the absence of data as to how and when they were established.

The Survey of Egypt has, at the request of this Administration, proceeded with the work of marking the boundaries of these cemeteries by pillars. This work has had the effect of diminishing the number of encroachments.

Several applications for private tombs were submitted to the Department and routine inquiries resulted in their refusal.

GENERAL HOSPITALS.

It is very satisfactory to be able to report that during the year several notables have interested themselves in collecting funds and have personally given donations of money and land for the building and upkeep of new hospitals. Owing to the high cost of building still ruling, it is difficult to take full advantage of their generosity, but it is to be hoped that in the near future some buildings may be completed, as the existing hospitals are inadequate in number and size for the needs of the country. The building and endowment of hospitals by private individuals is naturally to be encouraged.

Messrs. Thos. Cook and Son who for years had maintained a small hospital at Luxor, have now generously presented the site, building and equipment to the Egyptian Government. As soon as the work of repairs, &c., can be finished, the hospital will be reopened.

It is proposed to open a school of midwifery at Qasr el 'Aini Hospital, so that a more efficient type of midwife than at present exists may be available for the poorer women of Cairo.

One of the most pressing hospital needs for Cairo, is the provision of a large general lying-in establishment in which women of the poorer classes could be attended to when necessary. Such a hospital, moreover, would provide a suitable means of instruction for Egyptian women desirous of taking up the profession of midwife or nurse.

It is satisfactory to record that the distrust and dread of attending and being admitted to hospital is slowly giving way to a disposition to avail themselves of hospital treatment.

In December, 1919, an anthelmintic annex was attached to Qasr el 'Aini Hospital and during this year similar annexes were attached to Qalyūb, Benha,

and Mansūra General Hospitals for the free treatment of out-patients suffering from ankylostoma and bilharzia infections, and it is hoped that during the coming year similar treatment centres may be attached to other provincial hospitals.

The number of beds in the Qasr el 'Aini hospital has been increased owing to the use made of the basement for wards and also the larger use made of the foundlings' home; this building, which was previously used for foundlings only, is now used, not only for these, but for the children suffering from ailments to which they are liable, as well as for obstetric cases. In addition to this, another operating theatre has been added and tents for the treatment of patients suffering from bilharzia and ankylostomiasis were erected in the quadrangle of the hospital at the end of 1919.

In 1913 there were two surgical sections, two medical sections, one skin and gynaecological section, one throat section and one ophthalmic section with two surgeons, two physicians, one gynaecologist and one ophthalmic surgeon, together with their assistants and one registrar. At the present time there are four surgeons with two assistant surgeons, four physicians with two assistant physicians, two gynaecologists with one assistant, and two ophthalmic surgeons. There is also an assistant in charge of the throat, skin, venereal and children's department, making four assistants for the special departments. There are now also two registrars (one medical and one surgical). The number of house-officers has been increased from four to seven, making three medical, three surgical, and one casualty officer.

The number of in-patients admitted into the hospital during the year was 12,610.

The proportion of females admitted is gradually increasing, showing that more women are now seeking treatment than in past years. This is specially so in the gynaecological department and *Malga*, where more and more women come up for delivery and antenatal care. Death-rate 9.54 per cent. of in-patients admitted.

The classification of medical diseases has been changed. Endemic cirrhosis has been included under the heading of infectious diseases of doubtful or unknown aetiology. Until the aetiology of this disease is known the confusion produced by the use of such terms as "Banti's disease" and "endemic splenomegaly" will continue. Whether these terms mean the same condition in different stages of development will still have to be solved, as will also the relation of splenic anaemia to them.

8.6 per cent. of the medical in-patients suffered from tubercular disease, 7.5 per cent. from ankylostomiasis, 6.2 from bilharziasis, and 3.8 per cent. from pellagra.

In case of acute and subacute funiculitis a diplococcus has been isolated; in many of these cases the patient develops a hydrocele as well, and the question naturally arises whether this hydrocele, or in fact any hydrocele, is due to this inflammatory condition of the cord. This may be the cause of hydroceles in Egypt; on the other hand, another theory has been advanced that many of the male population of this country ride on donkeys with their legs straight

down, and that the cause of the hydroceles is due to minor degrees of trauma. The matter needs further investigation.

Two cases of liver abscess were aspirated only, and afterwards treated by emetine injections. Both cases did well.

One Albee's operation was performed for tuberculosis of the spine. The result of the operation cannot be judged, as the patient unfortunately developed an acute mastoid with a brain abscess, and in spite of free drainage by operation, died.

The treatment of tubercular glands of the neck, other than by operation, seems to show much promise. The cases sent to the X-ray department certainly show marked improvement, and in early cases a complete cure results. In late cases X-ray treatment certainly makes operation afterwards much easier.

Several cases of blood transfusion have been done. Two cases were done for a condition of splenomegaly. In one of these cases the patient was transfused both before and after the operation. His blood index rose from 20 per cent. hæmoglobin to 25 per cent. Two cases were also transfused for marked anaemia due to ankylostomiasis; they both showed a marked improvement. The number of cases is, however, too small to permit of any definite conclusions being reached. In all cases the blood of the donor was grouped by the bacteriologist before being used, to see if it were compatible with that of the recipient.

In cases of vesical calculus the supra-public operation is finding more favour than in the past. The reason for this is that bladder wall can be examined, and if bilharzia is present as well the bladder can be drained as part of the operation. If the bladder is clean and free from cystitis the wall is closed by suture, a small drain only being placed down to it in case of leakage. These cases are soon up again, the advantage, therefore, of the crushing operation, in point of time being much lessened; moreover, the risk of injury to the bladder wall and of rupturing the bladder is non-existent.

Much has been learnt during the war of the treatment of fractures as regards splints and plasters and their application. These principles are now being applied to cases of fracture in the hospital with much benefit, the method of Robert Jones and Thomas being much in evidence.

Bilharziasis.—There were 374 cases of bilharzial infection admitted to the Qasr el 'Aini Hospital.

Following upon the discovery by Christopherson of the specific treatment of bilharzial infections by tartrate of antimony, an annex was erected, the objects being, as recorded by Professor Day:—

"(1) To test the practical value of out-patient treatment of bilharziasis as regards the attendance of patients and the efficiency of routine treatment.

"(2) To find the best methods of specific treatment and the minimum dosage and attendance necessary for the average case."

The annex was opened in December, 1919, and has been well patronized since then: 931 cases of bilharzial infection were treated from December, 1919, till November, 1920, the great majority suffering from urinary diseases, as is shown here: Bladder in-

fection, 875 (of these, 11 were complicated by septic cystitis, 4 by fistula, 2 by filariasis); intestinal, 26; bladder and intestine, 39; urethra, 1: total, 931.

Only patients with active infection are suitable for specific treatment.

Patients with advanced disease often present the signs of septic cystitis and frequently pyonephrosis. Those with no ova or only a few dead ones are unsuitable, as treatment is useless. Where there was severe cardiac or renal disease, as also in pregnancy, antimony injections were avoided.

As was to be expected, a large number of patients ceased their visits as soon as their symptoms were relieved, as usually occurs within a week or two of commencing treatment. On the other hand, most patients with septic cystitis as a complication were diligent in attendance, though little benefit could be procured, and took as many injections as was deemed necessary. The injections were given intravenously, a 6 per cent. solution of tartrate of antimony being used. Adults took an initial dose of 1 gr., then 1½ gr., then 2 gr. on each subsequent occasion. The injections were given as a rule on alternate days. The condition of the ova in the urine and faeces was determined during the course of the treatment.

The minimum effective dose for an adult was found to be 13 gr., but a larger amount was generally necessary, the criterion being the permanent disappearance of living ova from the urine and faeces.

The best means of securing the death of the worms is to give an intensive course of tartar emetic and to continue its administration until all the ova became definitely opaque, not merely inactive. This can rarely occur under three weeks, often four, and corresponds to a total dose of 20 to 25 gr. for an adult.

Professor Day concludes that the primary effect of the treatment by tartar emetic is the destruction of the ciliated embryos within their shells, and that the parent worms require a larger lethal dose.

The antimony treatment was found also a useful adjunct previous to surgical operations for bilharzial diseases, e.g., bilharzial masses and fistulae.

Colloidal antimony and emetine in bilharzial infections were investigated and found effective.

The thirteen children's dispensaries worked continuously through the year, except Asyût, which was closed on the ground of lack of funds. The Asyût building, comprising accommodation for Children's Dispensary and Maternity School, was specially built in 1918, to replace the rented building where the work had been carried on for five years, so has only been utilized for its original purpose for a brief two years.

Thanks are due to private doctors for kindly giving advice in the more serious cases. Some of these practitioners attend regularly once or twice a week, which help is of much value.

It must always be remembered that though simple remedies are prescribed for the sick children attending the dispensaries, these institutions are also infant welfare centres, where the mothers receive instruction in the care of their children: in simple hygiene, correct

methods of feeding, suitable clothing, &c., &c., and above all the matrons try to inculcate habits of cleanliness.

This latter is a difficult matter under the prevailing primitive housing condition, with their total lack of any water installations or of lavatory accommodation. But progress is being made, as is evidenced by the cleaner faces and clothing of the children attending.

The dispensaries remain as popular as ever with the poorer mothers, who gladly avail themselves of the free help and advice proffered.

Care is taken to exclude any children of the better classes who can afford doctor's fees, and a rule is made that as far as possible the mother must bring the patient herself.

Some of the matrons and their assistants have sewing parties to provide clothing for the very poor, the mothers themselves assisting in making and mending the small garments.

One dispensary matron received L.E. 97 from H.E. the Mudir and local friends, which enabled her to turn out 777 garments, which were of inestimable value to the poorer children, many of whom come clothed in rags.

To create an interest in the future generation the headmistresses of some girls' schools have meetings of their staff and older pupils, out of school hours, when children's clothes are cut out and made, the resulting garments being presented to the maternity homes.

The seven schools for training native midwives in the provincial towns continue to do good work and remain open the entire year.

The value of these training centres is becoming more and more recognized amongst both the general public and the medical profession, and in many cases where other provincial institutions were threatened with closure early in the year, assurances were volunteered by the authorities that these schools would remain open.

Though the maternity centres are not equipped as hospitals and are essentially for extern work, thirty-nine women have applied for admission and been treated in the emergency bed provided at each school.

The visits of the matrons and *dayas* to the patients in their own homes numbered 39,245, and useful teaching is given to the mothers during the seven days' treatment following the baby's birth.

Owing to the freedom of access to the people's homes, centres of infection are frequently recognized in the early stages.

As far as possible, pupil-midwives are chosen from the younger relatives of the hereditary *dayas*. This plan disarms the suspicion and opposition of the town-*dayas* and trains their successors in clean, up-to-date methods.

In several of the maternity schools H.E. the Mudir very kindly presents at the end of each term a prize to the best pupil. The prize takes the form of an equipment box (bearing an inscription plate) with all the necessary fittings, a reward which is very much appreciated, and encourages good work among the

pupils, who value their outfit as the visible sign of their profession.

During the year four sisters have been engaged in inspecting, in co-operation with the matrons, the *dayas* throughout the country, with special attention to those who have been trained in the Provincial Council maternity schools.

The *daya* is encouraged to re-visit the school from time to time to talk over her cases with the matron and to restock her equipment box.

The visits of the sisters to outlying villages is also useful in stimulating interest in the work among the *omdas* and notables, and in gaining their assistance in the selection of suitable pupils for training.

The *omdas'* influence is also felt in assisting the newly-trained women to get a proportionate share of the work, as the old untrained women often set themselves to work actively against their trained colleagues, spreading calumnies against them to prevent them getting a fair proportion of cases.

OPHTHALMIC HOSPITALS.

The need for ophthalmic treatment has two entirely separate origins. The first is the prevalence of a chronic disease of the membrane lining the eyelids, trachoma; and the other is a group of acute contagious ophthalmias which are the main cause of blindness in Egypt.

About 15,000 patients who sought treatment at the hospitals were blind in one or both eyes: this is about 14 per cent. of the new patients. A system of prophylaxis has yet to be discovered. The clinical research work which is being carried out at the ophthalmic laboratory, at the ophthalmic hospitals, and at the ophthalmic clinics of each of the Government primary schools all over Egypt, should eventually shed some light on prophylactic measures. The importance of obtaining treatment for babies and children attacked by ophthalmia is beginning to be recognized by the people; more than 6 per cent. of all patients treated were under the age of 1 year, and 40 per cent. were under the age of 15 years.

The provision of a special ophthalmic hospital in Cairo is urgently required for three reasons. First, because there is insufficient ophthalmic out-patient relief available for the thousands in Cairo who suffer, more especially during the hotter months, from painful and destructive diseases of the eye. It ought to be known more widely that it is impossible with the existing hospital facilities of Cairo to cope with the vast number of patients who come to hospital demanding operations to relieve inward growing eyelids and eyelashes, one of the cicatricial results of trachoma. The hospital should be centrally situated, equipped with one hundred beds, and be able to treat 2,000 out-patients daily in the summer. Secondly, the important post-graduate teaching which is carried out by the Director and inspectors is hampered by the inadequate accommodation afforded by the tent hospital at Giza. Thirdly, the clinical research work has insufficient facilities both as regards the number of patients available for study and as regards the laboratory accommodation.

Colonial Medical Reports.—No. 152.—Egypt (continued).**INFECTIOUS DISEASES.**

During the year 1920, there was a very striking declension in the case incidence of most of the important infectious diseases.

A notable reduction of cases of small-pox took place from July onwards. This was probably the effect of the vaccination campaign which was begun in 1919 and has been steadily carried out throughout 1920.

As stated in the preceding annual report, two and a half million people were revaccinated in 1919. In 1920 three million revaccinations were done. This makes a total of five and a half millions, rather more than a third of the population of the country.

The decrease in the incidence of cases of typhus fever is probably due in great part to the disappearance of the movement of labour, which, during the war years, was undoubtedly responsible for the excessive propagation of this disease and relapsing fever which then occurred in Egypt.

Some proportion of the declension may perhaps be ascribed to the increase in knowledge on the part of the village authorities of the benefit of early notification of infectious disease, and some to increased skill on the part of the epidemic staff in carrying out the various delousing procedures.

The number of cases of relapsing fever show a reduction of 12 per cent.

The causes of this reduction are the same as those noted under typhus.

There was no recrudescence of the epidemic of malaria at Dirr. Steps have been taken to fill in dangerous *birkas* in this region, and during the autumn of the year stocking of the wells with fish was continued. No new cases were reported from this area.

PUBLIC HEALTH LABORATORIES.

The work on the foundations of the extension of the laboratories, which was suspended in the autumn of 1919 by the rise of the subsoil water, was to have been recommenced on January 27—the ground-water level having sufficiently fallen to permit of work—but had again to be postponed. The first delay was caused by the intentional cutting of a water-main during the labour troubles in Cairo, and the second by the accidental bursting of an old main. Both these resulted in the flooding of the excavations, and it was not until the beginning of May that the work could be resumed. Since that date the work has progressed satisfactorily and the masonry and a large part of the woodwork is now completed. The old building which was formerly the Veterinary School has been repaired and replastered and the lower floor of this will be utilized for the accommodation of the clerical staff. The upper floor will house the library, thus freeing the rooms at present used for this purpose, these latter having been originally designed as laboratories.

The travelling bacteriological car belonging to the laboratories, which was lent to the Army at the

beginning of the war and had been used by them since then, was returned to the Department in March and has since been refitted and put in working order.

A small laboratory has been installed on the *Vigilant*, the river steamer of the Department.

The system of training boys for subsequent employment as laboratory assistants has been continued. Three such boys have finished their training and have been appointed to posts in the laboratories; fourteen are still under training. In addition, two boys received short courses of training for laboratory work in the hospitals of the Department.

At the request of the Arab Bureau a Moslem bacteriologist and a laboratory attendant from the Public Health Laboratories were again sent to Jeddah with a complete outfit of a bacteriological laboratory for the diagnosis of plague and cholera and remained there during the period of the pilgrimage.

The work of the laboratories and particularly of the Vaccine Institute has been naturally carried out under certain difficulties caused by the constructional work of the new buildings and the labour troubles in Cairo which resulted in two separate strikes at the Gas Company and a strike of the electric light workers, making the conditions of work somewhat difficult.

The laboratories were consulted in connection with the widespread condition of underfeeding existing in Egypt and, through the Hospital Section of the Department and by other means, inquiries were instituted as to the incidence of rickets, pellagra, and other deficiency diseases since the marked rise in the price of cereals which appears to have become acute in 1917.

WATER SERVICE.

A number of meetings of the Water Board have been held, dealing with various questions concerning the water supplies of Cairo and provincial towns, as well as other matters referred to them by the Department. A considerable amount of work has also been carried out in the laboratories in connection with an experimental plant for the clarification of village supplies. An experimental unit was erected by the Municipalities Section, Ministry of the Interior, at Helwân, and trials of this plant have been commenced.

VACCINE INSTITUTE.

In view of the prevalence of small-pox in Egypt, it was decided by the Department, in the autumn of 1919, to undertake a large campaign of general vaccination, and very large demands were suddenly made on the Vaccine Institute. It was originally estimated that an output of one million doses of vaccine per month for a period of six months would be sufficient to complete the campaign. Subsequently, however, it was decided to largely increase the scheme of general vaccination and a very much larger amount of vaccine had to be prepared. As the Vaccine Institute was designed for a maximum annual output of some two million doses of lymph, the production of the ten million

units actually prepared during the year threw a great strain on the staff and equipment of the Institute, particularly in view of the fact that building operations were going on throughout the year and that the greatest possible difficulty was experienced in obtaining suitable calves for the production of the vaccine. All difficulties, were, however, overcome and the production of the necessary large amount of vaccine under the existing condition is very creditable to the staff of the Vaccine Institute.

In the use of the vaccine, a number of cases of a secondary eruption were met with. This eruption was popular in character and was most marked some fourteen days after the date of vaccination. It was only observed in primary vaccinations in young children and was not as a rule severe, although a certain number of severe cases occurred. Even in these, the eruption did not, however, appear to be accompanied by any marked general symptoms and no fatal cases were recorded.

INSPECTORATE OF PHARMACIES.

The number of pharmacies existing in the country at the end of 1920 had increased by one as compared with the previous year, there having been twenty-eight new pharmacies opened in 1920 and only twenty-seven closed. The actual number of pharmacies existing in 1920 was therefore 375. Of these, 284

were inspected during the year. In 112 cases faults were found. As regards these it was noted that a smaller proportion of pharmacies showing unsatisfactory conditions was found amongst those owned by qualified pharmacists than amongst those with other ownership, fault having to be found in 50 per cent. of the former as against 69 per cent. of the latter.

The control over the traffic in cocaine and morphine is far from satisfactory. Until conditions permit of the application of laws of greater severity applicable to foreigners equally with local subjects, and penalizing not only the seller but also the purchaser and consumer, but little can be done towards stamping out the illegal traffic in these drugs. Under existing laws the maximum penalty is only 100 piastres fine and seven days imprisonment. No sentence of imprisonment is ever pronounced; but even if it were, the profits are so large that a short period such as this would act as a very slight deterrent.

Opium.—The cultivation of the opium poppy having been permitted, six new authorizations were issued during the year, making the total number eighteen. These authorizations are issued for the purchase of opium produced in the country for export only, but as there is no control on the quantity produced, it is certain that a large amount will be disposed of clandestinely and consumed locally.

Colonial Medical Reports.—No. 153.—Fiji.

BUREAU OF ANKYLOSTOMIASIS. OBSERVATIONS ON TWENTY THOUSAND TREATMENTS WITH CARBON-TETRACHLORIDE.

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SUVA, FIJI,

June 1, 1922.

ON November 19, 1921, Dr. Maurice C. Hall, Senior Zoologist of the United States Bureau of Animal Industry, published in the *Journal of the American Medical Association* the results of some studies with carbontetrachloride as an anthelmintic in dogs. He found that 0.3 c.c. of the drug for every kilogram of body weight sufficed to expel all the worms without subsequent purgation. Thus to a dog weighing 10 kg. he gave 3 c.c. of carbontetrachloride. He had not been able to achieve this result with any other anthelmintic. He also made tests of the drug in combination with thymol and with chenopodium, which showed equally favourable results. He made tests with monkeys, swine and horses. After months, post-mortems on these animals showed no pathological changes in the organs due to tetrachloride. Dr. Hall, himself, took 3 c.c. of the drug without symptoms.

The Bureau of Ankylostomiasis of the Medical Department of the Colony of Fiji has administered in the period from February 11 to May 30, 1922, this treatment to over 20,000 individuals. This paper gives the steps leading up to these wholesale treatments and the observations made on them, because it is considered that the material obtained is valuable enough to warrant a wide distribution.

TESTS.

A number of cautious tests were made in the Colonial Hospital, Suva, under the supervision of the Resident Medical Officer. The dose of the drug was given the patient, and his stools were washed and the worms counted for three days. After a week a test treatment was given and the stools again washed and counted for three days to recover the remaining worms. Thus the percentage of drug efficiency was established. All this work was done by a European assistant of long experience, aided by Fijian medical students.

Everyone knows how difficult it is to control any kind of native for three days of trial, and three days of test treatments. This is even more difficult now when East Indians are feeling their first "growing pains" of a national spirit. Stools were lost from some trial and from some test treatment. However, the following groups of persons fulfilled every condition.

The first test was of a group of four Indians. These were given a purge of castor oil on the evening preceding the treatment. The carbontetrachloride was given at 7 a.m. on an empty stomach. There was no succeeding purge. A test treatment of oil of chenopodium was given one week later. It has been determined that such a test treatment after a trial treatment removes all remaining worms.

Test No. 1.

Number of persons: 4.

Preliminary purge: 3 c.c. tetrachloride; worms expelled in three days: 244.

Test treatment: 3 c.c. chenopodium; worms expelled in three days: 4.

Total number of worms expelled: 249; expelled by one dose 3 c.c. (45 minims) carbontetrachloride, 98 per cent. One of these, having 95 worms, was cured.

In the second trial 4 c.c. (60 minims) of the drug was given to two adult Indians with no preliminary purge. The usual test treatment was given after a week.

Test No. 2.

Number of persons: (a) 1, (b) 1.

No preliminary purge; 4 c.c. carbontetrachloride; worms expelled in three days: (a) 185, (b) 528.

Test treatment: 3 c.c. chenopodium; worms expelled in three days: (a) 4, (b) 24.

(a) Total worms expelled: 189; expelled by one dose 4 c.c. carbontetrachloride, 97 per cent.

(b) Total worms expelled: 552; expelled by one dose 4 c.c. carbontetrachloride, 96 per cent.

At the Dilkusha Indian Mission we made our first mass treatment of 500 persons. We made counts on twenty-four Indians, who ranged in age from 4 to 18 years of age. An arbitrary dose of 0.2 c.c. (3 minims) to the year with a maximum dose of 3 c.c. (45 minims) at the age of 15 years and upwards was given to these twenty-four people. No preliminary purge was given them, nor any subsequent purge unless their bowels failed to act. This was a light infection, as most of them had been receiving treatments for hookworm for several years.

Test No. 3.

Number of persons: 24.

No preliminary purge; 0.2 c.c. tetrachloride to year to age of 15; worms expelled in three days: 397.

Test treatment: 3 c.c. chenopodium; worms expelled in three days: 5.

Total worms expelled: 402; expelled by one dose tetrachloride, 99 per cent.

Dr. Kalamkar made fourteen tests in the Government Gaol in Suva. Most of these individuals had

received several treatments for hookworm previously, so that the average worm count was low. These comprised seven Indians and seven Fijians. Counts were made for two days only, after the trial and after the test treatments. The dose was given on an empty stomach at 7 a.m. with no preliminary purge. An ounce of Epsom salts was given three hours later.

Test No. 4.

Number of persons: 14.

No preliminary purge; 4 c.c. carbontetrachloride; 1 oz. mag. sulph. three hours later; worms expelled in forty-eight hours: 215.

Test treatment: 3 c.c. chenopodium; worms expelled in forty-eight hours: 13.

Total worms removed: 228; removed with one dose tetrachloride, 94.5 per cent. Seven of the patients were cured by the one dose. It is recognized that it is more difficult to secure a high percentage of drug efficiency with a light infection than with a heavy one. Originally there were sixteen persons in this group, and only four showed positive by microscope. Of the original sixteen, all of whom were treated, only two were negative by worm count.

SYMPTOMS.

There was almost a total lack of symptoms in the fourth group that received the purge after the drug. Not one of them was incapacitated for his regular duties. With the previous tests, either with or without the previous purge but with no after purge, there were some who had minor symptoms. Many were sleepy for several hours. Two small adults in Test 3 vomited. Several had severe headaches for two or three days.

Test No. 5.

A young Indian working in the office was given 3 c.c. (45 minims) of carbontetrachloride at 7.54 a.m. He had five bowel motions by 10.15 a.m., which when washed gave eighty-five hookworms. His total count for three days was 101 worms. His test treatment showed him to be cured. This illustrates the rapid expulsion of most of the worms by this drug which we have observed generally.

On the basis of these tests made under his immediate observation, the Chief Medical Officer, Dr. A. Montague, adopted carbontetrachloride as the drug to be used for treatment of hookworm disease in the Government institutions in Fiji, and recommended its use for routine field treatments by the Bureau of Ankylostomiasis. It was decided to use the dosage of 0.2 c.c. (3 minims) to the year with an adult dose of 3 to 4 c.c. (45 to 60 minims), depending on the size of the adult. This was to be given in water on an empty stomach, followed in three hours by 1 oz. of magnesium sulphate.

Plan of Routine Treatment.—The work of Dr. Darling and Dr. Barber of the Malay Commission* in 1917, and of Dr. G. P. Paul† in 1917-18, has

* Auspices of International Health Board.

demonstrated beyond question that, speaking broadly, almost every Fijian and every Indian has hookworm disease. The cost of a hookworm campaign is largely administrative. As it is known that nearly 100 per cent. of Fijians and Indians in Fiji are infected, there is no advantage in examining and re-examining the whole population, a method which accounts for so large a proportion of the expense of the average hookworm undertaking. Our plan in Fiji is to educate the people by public and private lectures and demonstrations, by distribution of literature and by picture film to realize the necessity of taking treatment to cure hookworm disease and advance their standard of sanitation so as to check its spread. It is impossible with the present heavy soil pollution and the low ideals of sanitation to eradicate the disease from Fiji. The question is whether it is better to follow the usual method and remain in a district and examine and re-examine and treat and re-treat those shown to be infected by the microscope, which is not a reliable guide as to cure; or to sweep over a large area with propaganda and treatment, reducing a 100 per cent. infection to 9 per cent. with one treatment, possibly returning at the interval of a year for another treatment of the whole population.

It would be far cheaper to go over a large area twice in this manner than to treat a smaller area to a cure. In a heavily-infected population with gross soil pollution, by the time a cure has been established in all those found infected by microscope, a fair infection may be found among those first treated. By the method of mass treatment large populations can be gone over at such periods as may be found necessary to maintain health till such time as the standard of sanitation has been raised enough to check the spread of hookworm disease, and this at no exorbitant expenditure. Then, too, this periodical cleaning out of the egg-laying females from the infected over a wide area must have a decided effect in reducing soil pollution.

Our staff consists of a director, two assistants, one of whom is a trained European and one an Indian doctor lent by the Government, two Fijian microscopists, and six field inspectors, three of whom are Fijians and three Indians. As each district is entered several thousand specimens are examined to establish the rate of infection. A month after treatment has been given another survey of typical areas is made and sufficient examinations made to see that the work has been well done and ascertain the degree of infection remaining. As the inspectors go from house to house on these surveys, they endeavour to educate the people about soil pollution diseases and to improve their sanitation. At present one course only of treatment with tetrachloride is given in a district as the re-examination by the microscope gives such a high percentage of cures. There is a large percentage of error in microscopic findings in hookworm disease, but with the salt flotation method of examination all but the lightest infections are found. In any case our findings are as accurate as other results found in routine field work and can be compared with them.

All negatives found on re-examination are checked by an experienced European microscopist.

Work in Detail.—From February 14 to May 30, 1922, over 20,000 people have been treated with carbontetrachloride by this staff. As the plan of campaign develops it is expected that 6,000 per month will be reached. In a more closely settled country with a tractable people even greater numbers might be reached. With East Indians who, as found in Fiji, are more difficult to handle, the number might be lower. This 20,000 were composed of 1,000 Europeans, 6,500 Indians and 13,000 Fijians. The original examination showed a microscopic infection rate of 89 per cent. among the Fijians, and 93 per cent. among the Indians.

Re-examination has been made to date of 823 in this district, of which 72 were still found infected. This indicates that our one-treatment method has reduced a 100 per cent. infection to less than 9 per cent. It is only reasonable to expect that as our raw staff becomes better trained and our field methods improved this percentage will be reduced even lower. As a matter of fact, we are already getting better results each month. These specimens are not selected but are taken from here and there, more than half of them being re-examinations of Indians.

Cost.—The cost of the work for this three and one-half months has been £387. This sum does not include the salary of the director, because this overhead charge could be spread over at least four more units of the same size in a large enough area. It does include every other charge, among which are charges for non-expendables which should be spread over a longer period of time to give a fair estimate of the cost of this method. If this sum is divided by the number of treatments (20,500) we find the cost to be fourpence-halfpenny per treatment.

Dosage.—The dose given is 0.2 c.c. (3 minims) to the year to the age of 15 when the adult dose of 3.4 c.c. (45-60 minims) is reached. The maximum dose given depends on the size of the adult. It may be shown later that much larger doses than this can be given safely.

Children take the drug better than adults in our dosage. We have given 3 c.c. (45 minims) to many adults over 80 and to one man of 93. We give the accepted dosage to all ages from two years onward.

Method of Administration.—The drug is placed on a tablespoon or in a small glass and covered with water and swallowed. It has a faint smell reminding one of carbon bisulphide, but no taste. It may give a sensation of heat when swallowed. At first we gave no preliminary purge and left mag. sulph. to be taken if the bowels did not act. Later we found that a routine dose of mag. sulph. given three hours after the drug eliminated most of the symptoms. The drug should be taken on an empty stomach to get the best results. When the patient is constipated we think a mild laxative on the preceding day is beneficial. We advise the patient to rest for the day, but as a matter of fact they do not. Nearly all of them carry on their work as usual.

Colonial Medical Reports.—No. 153.—Fiji (continued).

Symptoms and Physiological Effects.—The symptoms depend on the amount of absorption of the drug by the human host. The drug itself is a purge when taken in sufficient dose on an empty stomach. This action seems to be diminished or lost when taken by one suffering from constipation or when food has been taken just before or just after the drug. It is in these cases that symptoms of absorption occur. These symptoms seem to be the same as those of a person recovering from chloroform anaesthesia. The commonest one is a dull headache which may last two or three days. This is best relieved by free purging with magnesium sulphate. A few have reported nausea and vomiting. Many are sleepy for several hours after taking the medicine. A few report headache who have followed the directions to the letter. But since we have been giving the mag. sulph. three hours after the drug as a routine measure there have been only rare cases who have reported symptoms to us at all. When we have cases under control we never hear of symptoms. Recently we treated 360 Indian immigrants at Nukulau Quarantine Station with somewhat larger doses and no single person had nausea or vomiting and no one reported headache.

Our tests seemed to indicate that there was most absorption when there was no purge; some when the purge was preliminary; almost no absorption when a purge was taken several hours after the drug. The fact that we have been able to treat 20,000 people with an adequate dose administered by relatively uneducated Fijian and Indian assistants without a death speaks for the safety of the drug. No one has been forced to take the treatment by legal action. The fact that with so small a staff we have been able to treat so many is a demonstration that it is easy to take and gives few symptoms. Such urinary records as we have been able to get have shown nothing pathological. The action of the heart seems to be slowed a few beats per minute for two or more hours.

Contra-indications.—Alcohol is contra-indicated. Our severest symptoms have been found in those who have taken several drinks in the interval of several hours before to several hours after taking the drug. Food taken just before or after the drug has a very constipating effect, and results in increased absorption.

Other Parasites.—Carbontetrachloride is not so effective as a vermifuge for *Ascaris* in the dosage here given, as is oil of chenopodium. In our tests only 40 per cent. of them were removed by it. This is regrettable in Fiji where there is so high an infection rate with this parasite.

Tricocephalus dispar.—The drug occasionally removes a few of these, but is not curative.

Oxyuris vermicularis.—Carbontetrachloride seems to remove these in large numbers.

Public Support.—By no means the least valuable feature of this treatment is the fact that with it, it is easy to secure individual and public co-operation. There is much less opposition to our campaign than

to one which uses chenopodium or thymol. Rarely do we have a refusal to take the treatment. Our dispensary in Suva was started two months before we were ready for that district in response to a public demand for treatment. In that period 2,000 have been treated at their own solicitation.

RESULTS.

It is too early to predict results from this method of mass treatments by carbontetrachloride, but it is interesting to quote an extract from a letter of the District Medical Officer of the district in which we have been working, to the Chief Medical Officer of the colony. This was written two and half months after we had been working in his district:—

“(4) The health of the district for April was excellent with only one case of typhoid and three cases of dysentery. I might mention that since the hookworm campaign has been established here there has been a distinct decrease in the amount of sickness in the district. I am of the opinion that the hookworm treatment has had a very beneficial effect, particularly amongst the Indians and Fijians. Whether this effect will be lasting remains to be seen.

I would advise that free treatment with carbontetrachloride be issued to natives, at either of the hospitals, at least once a year in order to eradicate the disease.”

In the centre of the district is a small chemist's establishment maintained by the Colonial Sugar Refining Company which sells drugs to the natives. During the month of May it sold sixteen shillings-worth of drugs. Its average for the previous months had been five pounds.

Conclusions.—(1) We consider that the new treatment is epochal in its relation to the treatment of hookworm disease. (2) Carbontetrachloride is a vermifuge and vermicide of great potency which gives little discomfort to the patient. (3) It permits of the rapid treatment at a low cost of the vast populations suffering from hookworm disease. (4) Our record of over 20,000 treatments seems to show that one treatment to each individual in a population will reduce an infection rate of 100 per cent. to less than 9 per cent. as shown by the microscope. (5) Clinically the standard of the health of the community is raised immediately.

ANKYLOSTOMIASIS.*Mass Treatment by Carbontetrachloride.*

Report by S. M. LAMBERT, M.D.

SUVA,

July 19, 1923.

JUST a few generations ahead of us the pressure of subsistence will become so great in the temperate climates that we shall be forced to develop the Tropics and settle them. This process has been going on during the past forty years at an accelerating speed, the principal obstacle being the diseases that abound in the hot zone. The first great impetus given to tropical development was the discovery of Ross that malaria is transmitted by the mosquito. This was followed by the demonstration of Reed and Carroll in Cuba that yellow fever was also a mosquito-

borne disease. It was demonstrated by Gorgas in Havana and Panama that yellow fever could be eliminated and malaria controlled.

Hookworm disease is one of the present great obstacles to the economic development of the Tropics. It is said to infect 90 per cent. of tropical races. This infection is heavy enough in the majority of tropical people to be a clinical consideration. The others with a slighter infection act as carriers to feed pollution to the soil and perpetuate the infection. The Tropics cannot be developed in the face of this disease left untreated.

The usual plan for a hookworm campaign in a country is to choose a small area of about 2,000 people and examine the bowel motion of each person for the eggs of hookworm. Each person found so infected is treated and after a time re-examined, and, if not cured, re-treated. Sometimes a number of treatments are necessary for a cure. This is slow and expensive, but has been necessary because the drugs used have been (1) disagreeable to take, (2) powerful poisons when not carefully administered, and (3) relatively unsatisfactory in removing intestinal parasites. The first of these (1) has meant an intensive propaganda largely to convince people of the necessity of taking a disagreeable medicine; the second (2) has meant close supervision of dosage; the third (3) has meant repetition of examination and treatment. All three have meant slow, expensive progress.

Many persons have refused to take more than one dose. The microscope has been shown to be from 20 to 40 per cent. in error on faecal examination. This also has left many in each district still infected and carriers of the disease.

There is another source of error in field work which I have never seen discussed, but which is considerable and which may at times be credited as microscopic error. In tropical countries the Inspectors who come in contact with the native usually have only a moderate education. Specimen tins, with the name and age of each individual in the family written on them, are left at each home. Usually these people cannot read. What provision can be made that the right person puts his specimen in the right tin? One can estimate from these tins the microscopic infection rate of a community, but who knows if the right person gets the medicine?

Because of the nauseousness of the usual drugs, a hookworm campaign has rarely obtained the cumulative popularity that its benefits to the community have warranted, and each small area of 2,000 has had to be undertaken as if it were new territory. The campaign has operated so slowly that by the time the last section was finished in an area, already there was an appreciable re-infection growing up in the first section.

Through this slow method of operating which was necessitated, I believe, by the character of the drugs used, the problem of hookworm eradication by the use of drugs was left unanswered. Each unit of operation demonstrated the beneficial results of such a campaign, but the method was so slow and expensive

that there was no hope of applying it to large populations in a wholesale manner.

On November 19, 1921, Wilbur C. Hall, Senior Zoologist of the United States Government, announced the application of carbontetrachloride as a perfect vermifuge for hookworm in animals. He took a dose himself with no ill-effects. Since that time many tests have been made in different parts of the world with this drug in man. I believe that this discovery of Dr. Hall's will confer on the Tropics the greatest benefit since the discovery of Ross. In Fiji from February 14 to July 15, 1922, 27,000 individuals have been treated by it without a casualty. The plan adopted in Fiji may be used in any tropical district with a high infection rate. In Papua and New Guinea an infection rate of 60 to 70 per cent. found in the field by European microscopists proved to be by worm count following treatment and worm count following necropsy, an actual infection rate of 95 per cent. Granted then an infection rate of 60 to 70 per cent. in a country, why examine the whole population? The securing of specimens of bowel motions is the hardest work in a campaign and with the examination consumes a large portion of the expenditure. If ninety to ninety-five in a hundred of a population is infected, the percentage of error committed is smaller when the whole population is treated than when only those found infected by microscope are treated.

There are two schools of opinion on the extent to which a community should be treated for hookworm disease. One is led by Colonel Clayton Lane who believes that any infection with hookworms, however light, is injurious and deserves complete treatment. The other school, led by Dr. Darling, says there are two distinct conditions—(1) hookworm infection with a small number of worms that do little or no harm, and (2) hookworm disease with a greater number of hookworms; and that it is economic waste to spend time, energy and money treating the former class.

My own experience convinces me that Colonel Clayton Lane is right. However, that has become an academic question with mass treatments with tetrachloride, for it is far cheaper to treat the whole population than to select positives. With a drug which has proved harmless, which gives so few symptoms, it is easier to treat a person than to obtain a specimen from him.

These treatments in Fiji have been given by a unit consisting of one director, two assistants, one of whom is an unqualified European and the other an Indian sub-assistant surgeon, and six native nurses or field inspectors. Public lectures are given with lantern slides or a moving picture film, which explain the nature of hookworm disease. Each inspector has a book consisting of a series of pictures explaining hookworm disease, which he carries from house to house as he surveys and takes his census. At this time he makes an appointment for treating each household. On the proper day he appears with his measure glass and bottle of tetrachloride, gives his dose, and leaves a quantity of magnesium sulphate to be taken later. (The details of treatment and

results have been discussed in a former paper.) When a district has been gone over once, sufficient re-examinations are made to establish the microscopic rate of infection remaining. We have found that one dose of carbontetrachloride reduces the infection found in Fiji to less than 9 per cent. Six thousand a month can be treated by such a unit as mentioned above. Whether it pays better to treat a whole area a second time to eliminate this 9 per cent., or to spend that time in reducing the infection of a new, equally large area, is a matter to be decided.

Twenty-seven thousand doses without a death means a comparatively safe drug. It has shown itself to be popular. We could treat half of Fiji from a central office by voluntary solicitations. The drug is cheap. In Fiji it costs 4s. 3d. per lb. to import from Australia, and one pound treats an average of eighty people. One dose of tetrachloride by reducing

the hookworm infection to 9 per cent. at the same time reduces the hookworm pollution of the soil to the same amount. We know now that the hookworm larva only lives six weeks in a tropical soil. Granted the use of carbontetrachloride with the knowledge of this latter fact, we now have some real hope of eradicating hookworm disease from any given area.

A gentleman who has been Colonial Secretary of several of His Majesty's Colonies suggests the possibility with proper organization of treating whole populations on one day a year, or two days a year six months apart. If this were done it would mean the elimination each time of over 90 per cent. of the egg-laying females which cause soil pollution. Such a plan would mean the control *en masse* of the ill-effects of hookworm disease. If this plan were followed for several years it might mean the permanent eradication of the disease as an economic factor.

Colonial Medical Reports.—No. 154.—Bengal.

ANNUAL REPORT OF THE LUNATIC ASYLUMS IN BENGAL FOR THE YEAR 1921.

By Major-General B. H. DEARE, C.I.E., M.L.C., I.M.S.

Surgeon-General with the Government of Bengal.

CALCUTTA,

May 1, 1922.

THE four lunatic asylums that were in operation (including the Lunatic Observation Ward, Bhowanipore) had a total capacity of 1,121, viz., 924 for males and 197 for females, as compared with 1,099 (901 for males and 198 for females) in 1920. The additional barrack with accommodation for twenty-four males that was constructed in 1920 at Dacca was taken into use last year; this accounts for the increase in the accommodation for males. There was, on the other hand, a decrease in the capacity of the Observation Ward from three males and three females to two and two respectively owing to the old buildings having been dismantled and new ones being under construction.

The total population, including observation cases which the lunatic asylums had to deal with during the year, numbered 1,210 as compared with 1,261 in the preceding year, their daily average having been 957·08 against 966·66. The maximum number confined was 988 (832 males and 156 females) as compared with 1,002 in 1920.

Altogether 187 lunatics were admitted or re-admitted during the year as compared with 278 in the previous year. The difference is due chiefly to the fact that the figure for 1920 includes observation cases, while that for the past year does not. Fewer admissions of private patients and military insanes were also partly responsible for the decrease in the year under notice.

Only twenty-seven lunatics were admitted on the certificate of the superintendents of the lunatic asylums.

The duration of insanity prior to admission was known in 106 cases out of 187; it was less than three months in thirty-five cases, between three and six months in nineteen, between six and twelve months in thirteen, between one and five years in twenty-seven, and over five years in twelve cases.

Seventeen private patients were admitted during the year against twenty in 1920. Excluding those admitted into the Bhowanipore Asylum for observation, the number of private patients was six only and the total population of such patients thirty-one, all being in the Berhanpore Lunatic Asylum. Six of them were discharged, viz., three cured and three otherwise, and twenty-five remained at the close of the year.

One hundred and thirty-eight lunatics were discharged as compared with 189 in 1920. The latter figure includes the discharges among observation cases. Of this number 106 cases were discharged cured against ninety in the previous year.

In forty-three out of the 106 cases cured, the duration of insanity prior to their admission was less than three months in twenty-three cases, between three and six months in eight, between six and twelve months in six cases, between one and five years in five, and over five years in one case.

The types of insanity of patients cured were mania, fifty-five cases; melancholia, twenty-one;

delusional insanity, three; alcoholic, two; insanity caused by *Cannabis indica*, twenty-four; and dementia, one.

The daily average number of sick increased from 116.29 in 1920 to 130.33, showing a greater prevalence of illness during the past year, although the asylums were free from outbreaks of epidemic diseases. Admissions into hospital numbered 861 against 612 in the preceding year. The largest admission was from fever, 222, almost all in the Berhampore Lunatic Asylum. Influenza of a mild type accounted for 162 admissions, viz., eighty in Dacca and eighty-two in Berhampore; eighty-seven patients were admitted for dysentery, viz., thirty-seven in Dacca and fifty in Berhampore; and fourteen from phthisis, all in Berhampore. A separate ward in the hospital is set apart in this asylum for phthisis cases. Every suspected case is watched and isolated, and the sputum is examined microscopically. Suspected cases are put on special diet, and open-air treatment is freely given.

The mortality was much lower than in 1920, being 6.89 per cent., to daily average strength as compared with 10.55 per cent.; the actual number of deaths was sixty-six, viz., twenty-five at Dacca and forty-one at Berhampore, as compared with 102 in 1920, of which twenty-four took place at the former, seventy-seven at the latter asylum, and one at Gobra. Dysentery was the cause of death in ten cases, pneumonia and acute mania each in eight cases, epilepsy in seven, and phthisis and diarrhoea each in six cases. Eleven deaths occurred among the new admissions.

Observation Cases.—Of these thirty-seven were certified as insane and admitted into the asylum or sent to the lunatic asylum at Ranchi, nine were pronounced to be sane and released, six others, although certified as insane, were released under Section 14, Act IV of 1912, and one remained over.

There was a criminal population of 530 in the lunatic asylums, viz., 213 at Dacca, 316 at Berhampore, and one at Gobra, as compared with 521 in 1920. Their daily average strength was 447.79 against 449.11. Fifty-three of them were discharged and thirty-two died. There remained, therefore, 445 criminal lunatics in the lunatic asylums on December 31, 1921, against 456 on the same date in 1920, viz., under trial, 223; acquitted, 149; and sentenced, seventy-three. Their crimes were murder in 211 cases, culpable homicide in thirty-six, grievous hurt in fifty-five, theft in

thirty-five, house trespass in thirteen, and other offences in ninety-five cases.

A second Sub-Assistant Surgeon was sanctioned for the Dacca Lunatic Asylum in April, 1921, and effect was given from the first of the same month to the revised scale of pay sanctioned in 1920 for the keepers and the barber of this asylum. A revised scale was also sanctioned in January, 1921, for the keepers of the Berhampore Lunatic Asylum, which had effect from April 1, 1920. A further revision of their pay was sanctioned later in the year with effect from February 1, 1921. The pay of the contingency menials of both the asylums was also raised.

At Dacca 12.73 per cent. of the mean population were employed daily on industrial work, and 61.37 per cent. at Berhampore as compared with 14.91 and 39.10 per cent. in 1920. The profit of the manufacturing department of the former lunatic asylum increased from Rs. 5,641 to Rs. 6,586; while that of the latter asylum decreased from Rs. 8,304 to Rs. 7,538. The decrease is attributed to a smaller sale of manufactured articles and less profit from the dairy due to the death of four good cows and eight calves from some infectious diseases.

At the suggestion of the Board of Visitors, an entertainment fund has been started at the Berhampore Lunatic Asylum maintained by public subscriptions and donations, and weekly "socials" are held for the entertainment of the inmates. Recreation rooms have also been provided both for male and female patients, where newspapers, periodicals and writing materials, as well as games like *pasha*, cards, chess, &c., are supplied.

The building of the new observation ward at Bhowanipore is still in progress. The administrative block, with quarters for the deputy superintendent and matron on the first floor, the clerks' and servants' quarters, ayahs' lobby, durwans' lodges, segregation ward and the European female ward, were completed last year.

Under the Indian Lunacy (Amendment) Act (922) lunatic asylums can now be called Mental Hospitals. Government have been moved for sanction to the change in the nomenclature of the lunatic asylums in this Presidency.

Government have accepted the proposal made by the Board of Visitors of the Berhampore Lunatic Asylum for the appointment of lady visitors for that asylum. Steps are being taken to carry it out.

Colonial Medical Reports.—No. 155.—Bengal.

REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES UNDER THE GOVERNMENT OF BENGAL FOR THE YEAR 1921.

By Major-General B. H. DEARE, C.I.E., I.M.S.

Surgeon-General with the Bengal Government.

CALCUTTA,

June 19, 1922.

THE department was under the administration of the late lamented Major-General W. H. B. Robinson, C.B., K.H.S., I.M.S., except for a little over six months, during which time he was officiating as the Director-General, Indian Medical Service. Lieutenant-Colonel F. O'Kinealy, C.I.E., I.M.S., acted during this period.

The most notable events of the year were the opening of the Calcutta School of Tropical Medicine and Hygiene and of the attached Carmichael Hospital for Tropical Diseases, which took place on November 15 and December 1 respectively, and also the opening of a third Government Medical school, viz., the Ronaldshay Medical School, Burdwan, in the middle of the past year.

Two medical institutions were added to the list of Calcutta hospitals and dispensaries, viz., the outdoor dispensary at Kailaghat, established by the Eastern Bengal Railway for the benefit of the staff of the railway offices, and the Carmichael Hospital for Tropical Diseases. Against this the Ripon Street branch of the Mayo Hospital was closed after two months' working owing to want of funds.

Altogether 445,088 patients attended these institutions (including 3,221 patients treated in the defunct Ripon Street Dispensary in the two months it was open), of whom 41,368 were in-patients and 403,720 out-patients, the number treated in 1920 having been 41,824 in-patients and 440,286 out-patients, or a total of 482,110. Thus there were 37,022 fewer patients treated during the past year. The decrease occurred almost entirely in the outdoor departments. The Mayo group of hospitals share the largest decrease, viz., 29,132, the reason being that the wards and buildings of the main hospital remained closed for eight months due to repairs, that the opening out of new roads in and about the Chandney Hospital area scattered many of the poor patients who used to attend that hospital, and that the Ripon Street branch was closed after two months' working. As regards the results in three institutions, 62·06 per cent. of them were cured against 58·10 per cent. in 1920, and 10·28 per cent. were relieved against 12·71 per cent., while the death-rate was comparatively low, viz., 14·58 per cent. against 16·53 per cent. in 1920. The Carmichael Hospital for Tropical Diseases treated 43 in- and 1,255 out-patients in the one month it was in operation.

There were 2,285 beds available in above three

hospitals against 2,228 in the preceding year. Twenty-six beds were added by the opening of the Special Department over the Elliott Ward of the Campbell Hospital for eye, nose and throat cases, and the opening of the Carmichael Hospital gave thirty-six additional beds. Against this there was a loss of ten beds in the hospitals attached to the Carmichael Medical College, Belgachia.

Three hundred and seventy-six nurses were employed in the Calcutta hospitals against 346 in 1920. The nursing staff of the Medical College hospitals was increased from 121 to 139. The post of the Night Sister of the Eden Hospital was abolished and an extra Labour Room staff nurse was appointed. The three Labour Room staff nurses now take the night duty alternately; this arrangement is working well. With a view to afford greater facility to the Medical College students for practical training in midwifery, the number of civil pupil nurses of this hospital was reduced by six and the number of pupil dhais raised.

The scheme for the standardization of the training, examination and registration of nurses and midwives which the State Medical Faculty, Bengal, sent up to Government on the initiative of this office, received the sanction of Government in February last. Under this scheme the Faculty will now control the training of the nurses and midwives and conduct their examination. They will also keep a separate roll of qualified nurses and midwives.

The largest attendance was from *eye* diseases. The number of such patients was, however, smaller than in 1920. The Shyama Charan Law Eye Infirmary treated 1,082 as in-patients and 18,169 as out-patients, and the Campbell Hospital, 295 and 3,754 respectively, in its Special Department opened in 1920. The new Eye Hospital in the compound of the Medical College, Calcutta, is almost complete and is expected to be opened shortly.

Malaria contributed the next large number, viz., 37,176 as compared with 44,584 in 1920.

Influenza was less prevalent, and the number of influenza patients declined from 10,494 in 1920 to 8,600 last year.

Smallpox was almost absent, there having been only eighty smallpox patients and seventeen deaths.

Cholera was endemic throughout the year, and 1,446 cholera patients were treated in the indoor departments with 365 deaths. The cholera ward of

the Medical College hospitals was closed last year to make room for septic cases of the Eden Hospital, and all cholera cases coming to that hospital were diverted to the Campbell Hospital.

Kala-azar presented 861 in-patients and 1,506 out-patients against 684 and 1,137 respectively in the previous year. The successful results attending the antimony department no doubt attracted a larger number of patients to the hospitals. The Campbell Hospital had the largest attendance, viz., 455 in-patients and 593 out-patients, and the Medical College hospitals treated 87 and 424 respectively. Two hundred and thirty-four *kala-azar* patients were treated at the Carmichael Hospital in the one month it was open, of whom seventeen were treated in the in-door department and 217 as out-patients.

The total number of patients treated for *venereal* diseases of all kinds was 20,624, of whom 1,824 attended the in-door departments and 18,800 were treated as out-patients. The Voluntary Venereal Hospital treated the largest number as in-patients, and the Medical College Hospitals the largest number as out-patients.

Tubercle of the lungs accounts for 686 in- and 1,371 out-patients, with 305 deaths. The special tuberculosis ward of the Medical College Hospitals was opened on January 1, 1921, consisting of sixteen bed for males and eight for females. In this ward 334 in-patients were treated during the year. Forms of treatment adopted were: (1) Tuberculin—bacillary emulsion and bovine tuberculin; (2) ethylester morrhuate; (3) iodoal; (4) tincture of iodine by mouth; (5) open air; (6) antiseptic inhalations. The majority of the cases were too far advanced to be benefited by any form of treatment. A few very early cases, however, responded markedly to tuberculin treatment, combined with rest, open air and good nourishing diet.

All classes of hospitals and dispensaries considered there were 44,056 surgical operations performed during the year as compared with 45,223 in the year before. The falling off is mainly due to the closure of the Ripon Street Dispensary, where a good amount of surgical work used to be done. The number of selected and important operations was almost the same as in 1920, having been 5,647 as compared with 5,682. Among the selected operations of the year under notice there were 1,034 extraction of lens, 823 abdominal sections other than obstetrical, 222 obstetric operations, and 254 operations on hernia, viz., 177 for radical cure and seventy-seven for strangulation.

Lt.-Col. J. C. H. Leicester, Obstetric Physician and Surgeon, Medical College Hospitals, has submitted an interesting report of the work done in the Eden Hospital during the past year. It is a record of good work carried on in a scientific and thorough manner. It contains a record of 127 important obstetric and of 367 gynaecological operations. Among the former there were twelve Caesarean sections, fourteen craniotomies, six decapitations, six inductions of abortion, and four versions; and among the latter, twenty-six ovariectomies, six removals of broad ligament cysts, fifteen hysterect-

omies, nine myomectomies, forty-six appendiceotomies, one cystotomy, one enterectomy, seven exploratory laparotomies, and twenty-seven partial oophorectomies.

Captain P. K. Gilroy, Officiating Ophthalmic Surgeon, Medical College Hospitals, and Superintendent, Mayo Hospital, performed the largest number of selected operations, viz., 703 in nine months of his incumbency, and Lt.-Col. W. V. Coppinger, 482 in three months. Major V. B. Green Armagata did 316 selected operations, and Lt.-Col. R. P. Wilson, V.H.S., 239 in the Medical College Hospitals. Lt.-Cols. F. P. Connor, D.S.O., and H. B. Steen, who was acting for the former while on leave, performed 131 and 155 selected operations respectively. Assistant Surgeons Karuna Kumar Chatterji and U. N. Roy Choudhuri, of the Campbell Hospital, did 415 and 365 selected operations respectively.

DISTRICT HOSPITALS AND DISPENSARIES.

Thirty-six dispensaries were opened during the year and three were closed. There was thus a net increase of thirty-three dispensaries. The District Boards of Khulna and Faridpur took advantage of the permission given by Government in 1920 to District Boards to establish, maintain and make grants to dispensaries following systems of medicines other than allopathic, and established one ayurvedic and one homœopathic dispensaries respectively in those districts last year.

Medical relief was afforded to 7,564,957 patients outside Calcutta as compared with 7,311,782 in the year before, or an increase of 253,175 patients.

Of the above number, 70,053 patients attended the in-door departments and the rest received outdoor relief. A smaller daily average attendance is due to the restricted admission of patients owing to the inability of many local funds and private-aided institutions to meet the cost of diet and treatment.

The class for the training of Indian nurses at the Mitford Hospital, Dacca, was opened in June last year with one lady nursing superintendent, two deputies, and twelve probationer nurses.

DISEASES.

Malaria.—Nearly one-third of the patients treated in district hospitals and dispensaries were from malaria. To enable the dispensaries to treat the malaria patients with adequate doses of quinine, the Director of Public Health, Bengal, supplied them with quinine and cinchona febrifuge, in addition to that supplied by the District Boards.

Cholera patients increased by about one-third.

Kala-azar.—A steady increase is noticeable in the number of *kala-azar* patients.

Leprosy.—Altogether 3,831 patients were treated for leprosy, viz., 918 in the special leper asylums and 2,913 in the hospitals and dispensaries (mostly as out-patients) as compared with 2,290 lepers treated in 1920, including 1,016 treated in the leper asylums.

The scheme for a leper colony received the general approval of Government, and sanction

was given to the acquisition of the necessary land in the district of Midnapore at a cost of Rs. 52,559. It was feared that the detailed plans and estimates would be delayed, as directions which the Public Works Department require for their preparation cannot be given by anyone except the Rev. Mr. Frank Oldrieve, the Secretary to the Mission to Lepers in India, who is now absent in England. A letter incorporating his views has now been received, and it is hoped the lay-out of the site and plans of buildings will shortly be commenced.

The surgical work of district hospitals and dispensaries of all classes, taken together, fell off slightly, 131,629 operations having been done in them as compared with 132,058 in 1920. Selected operations, however, increased; their number was 5,614 against 5,496. As usual, operations on bones formed the largest number of selected operations, viz., 1,213; excision of tumours and extraction of lens the next largest numbers. There were 318 obstetrical operations, and 256 abdominal sections other than obstetrical.

Medical relief is hampered in almost all district hospitals and dispensaries for want of funds. Local bodies are unable to provide sufficient money out of their limited resources to meet the increased expenditure due to high prices and enhanced rates of wages. Subscriptions are most uncertain, and in many cases have fallen off. Several hospitals have been obliged to restrict admission of in-patients to the most urgent cases only. Contributions for the services of Government medical officers have in many cases fallen into arrears; bills for medical stores and other hospital requisites supplied are outstanding. With a view to add to the income of dispensaries, permission has been given by Government, as a special case, to certain Mission and District Board dispensaries to levy a small fee from each new patient attending the dispensary for medicine, the very poor being exempted.

A separate set of rules were framed by Government for the management of non-allopathic dispensaries.

Colonial Medical Reports.—No. 156.—Asansol.

ADMINISTRATION REPORT OF THE ASANSOL MINES BOARD OF HEALTH FOR THE YEAR 1921-22.

ADMINISTRATION OF THE ACT.

Notification of Epidemics.

The system by which immediate notification of the outbreaks of epidemic diseases such as cholera and small-pox is obtained both from colliery and non-colliery areas of the mining settlement was described in previous reports. The system worked admirably during the year, and it was not found necessary to institute any prosecutions for failure to notify epidemic disease. The omissions on the part of colliery managers to notify such outbreaks immediately as required were almost nil, and those on the part of village chowkidars few. The attention of defaulting managers was drawn to such omissions by letter, and the village chowkidars at fault were dealt with departmentally by the sub-divisional officer, Asansol.

Although the legal responsibility for notifying epidemic disease in collieries to the chief sanitary officer devolves upon the manager, the doctor babu is the person on each colliery whose duty it should be to report such cases to the manager. It would therefore be advantageous if managers would punish defaulting doctor babus either by fine or in some other substantial way, so as to impress upon them the necessity of reporting such cases at once to them for notification to the chief sanitary officer.

Suppression of Epidemic Diseases.

Cholera.—The term cholera in this report signifies a communicable disease, characterized by purging, vomiting, cramps, and suppression of urine, and is presumed to be the disease referred to by former

writers as "cholera" before the discovery of the cholera vibrio.

There were altogether 1,200 cases of cholera accompanied by 583 deaths during the year, as against 468 cases with 193 deaths during the previous year. The increase is due to the fact that cholera was epidemic from the beginning of the financial year up to August, 1921. In December the disease appeared again in sporadic form, and lasted with gradually increasing incidence till the end of the financial year.

All the usual precautions were taken and the disease was successfully checked in all cases.

The disease was chiefly confined to the villages and municipalities of the settlement, only three collieries, Narsamuda, Sibpur and South-East Baraboni, being affected during the year.

In Sibpur colliery an epidemic broke out on May 27, which lasted until June 10, 1921, in which twenty-one cases occurred with nineteen deaths, the majority of the cases in all probability being due to drinking the contaminated water of ground tanks. The colliery authorities took the usual precautions under the supervision of the board's staff and the epidemic was successfully combated.

In South-East Baraboni colliery there were twelve cases of cholera with five deaths during July, 1921. The original infection is believed to have been carried there from Asansol. The majority of the cases were in all probability due to contact (nursing).

In the second week of April the disease broke out in epidemic form in Khorabar village, where fourteen cases with seven deaths occurred. The cause of the outbreak is unknown, but subsequent cases in the

village were in all probability due to the use of the water of contaminated tanks.

The village of Bhadur was infected in April, the disease being imported there from Ekra (Jharia). Fourteen cases with seven deaths occurred, the majority of which were in all probability due to drinking the water of contaminated ground tanks.

On May 3, 1921, a sporadic case of cholera occurred in Narsamuda village, the cause of which could not be ascertained. On the same day a second case occurred through contact (nursing). Both these cases succumbed. A ground tank was contaminated by the washing of the soiled clothes of these two patients, and the infection was in all probability conveyed thence to different parts of the village and to Narsamuda colliery, and on the next day a severe epidemic broke out. Two other ground tanks were subsequently contaminated, and the infection spread still further. In the village the epidemic lasted from the 3rd to the 13th, and in the colliery from the 4th to the 16th. The number of cases and deaths in the village was forty-four and twenty-four, and in the colliery twenty and fifteen respectively. Eleven cases in the colliery and fourteen in the village in all probability contracted the disease from using contaminated tank water, and nine cases in the colliery and twenty-nine in the village through contact (nursing). The tanks were sterilized three times a day with chloride of lime and guarded by chowkidars, and the disease thus remained strictly confined to the original locality.

The outbreak of the disease in Santa village in May was due to infection imported there from Baidyanathdam (Santa Parganas), where cholera was epidemic. Seventeen cases occurred with nine deaths, of which three cases were imported from Baidyanathdam, four cases were in all probability due to the use of the water of the contaminated tanks at Narsamuda village, referred to above, and eight cases to infection by contact (nursing).

In the second week of June the disease broke out in Rakhakura village in Baraboni thana, the cause of the outbreak being unknown, sixteen cases with eight deaths occurred within the week. The majority of the cases were in all probability due to the use of contaminated water. The contaminated tanks were sterilized with chloride of lime and guarded, and the epidemic ceased.

The village of Mojara was infected from Rakhakura village, and twenty-five cases occurred with eleven deaths, nineteen cases being in all probability due to contact (nursing). Bhanora village is also believed to have been infected from Mojara village. Seventeen cases occurred there with eight deaths, of which six cases were in all probability due to the use of contaminated water of ground tanks and five to contact (nursing).

In Samla village the disease broke out in July. The cause of the first case could not be discovered. Altogether twenty-one cases occurred with nine deaths, of which four cases were in all probability due to the use of contaminated water, and six to contact (nursing). The cause in the remaining cases could not be traced.

In Bollampore village fifteen cases with seven deaths occurred in July, of which two cases were in all probability due to drinking polluted water and five to contact (nursing). The cause in the remaining cases could not be traced.

In July cholera broke out in epidemic form in the village of Fulberia, the disease having been imported there from Puri (Bihar and Orissa) by a resident of the village, who had suffered from the disease at Puri and survived. The patient in all probability became a "carrier" and polluted the water supply of the village. During the following week a severe epidemic ensued, and sixteen cases with eight deaths occurred, almost all the cases were due either to the use of contaminated water or to contact (nursing).

During the month of August, 1921, the disease existed in epidemic form in the village of Ethora, a village in Salanpur thana with a population of 1,902. The primary cause of the epidemic was neglected diarrhoea, due to eating indigestible food. Forty-two cases with twenty-seven deaths occurred, of which twenty-six cases were due to contact (nursing) and five to the use of contaminated water.

The outbreak of the disease in Dakhinkhanda village in December, 1921, was primarily due in the first four cases to neglected diarrhoea, caused by eating indigestible food. Altogether fifteen cases with twelve deaths occurred, of which eleven cases were due to contact (nursing).

In the municipalities of Asansol and Raneeungee there were altogether 158 and 116 cases with eighty-two and forty-one deaths respectively during the year. More than 95 per cent. of the cases and deaths occurred during the months of May, June and July. From May 17 to 24, sixty-four cases with forty-three deaths occurred within Asansol municipal limits amongst the tea garden coolies returning from Assam who had disentrained at Asansol. Owing to the measures taken by the board's staff under personal supervision of the chief sanitary officer, no fresh infections occurred in the mining settlement, either amongst the coolies themselves or amongst the permanent population.

Of the total number of cases which occurred in Asansol and Raneeungee municipalities, eighty-two cases were imported from outside the mining settlement, forty-seven cases were in all probability due to the use of contaminated water, twenty-nine to contact (nursing), eighteen to neglected diarrhoea, due to eating indigestible food, and in nine cases the infection was in all probability conveyed by flies. The cause of the remaining cases could not be traced.

In all the villages of the settlement and in the two municipalities contaminated water supplies were sterilized and guarded at the board's expense. Infected houses were disinfected by the board's staff, and disinfectants provided to enable the relatives in attendance on patients to sterilize their hands. This latter is an important point in the suppression of epidemic cholera, as experience has proved that in the mining settlement, owing to the poverty and social customs of the people, the disease is in a great proportion of cases directly spread by contact (nursing).

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Small-pox.—The number of cases recorded from the disease was ninety-three with ten deaths as against 614 cases with fifty-two deaths during the previous year. The decrease in the number of cases recorded is due to the fact that small-pox was not epidemic during the year. From the beginning of the financial year to July the disease appeared in sporadic form occasionally assuming mildly epidemic proportions, and disappeared in August. It re-appeared in November in sporadic form and assumed epidemic proportions at the end of the financial year. All the usual precautions were taken by wholesale vaccination and re-vaccination and the spread of the disease was thus successfully checked.

The places principally affected by the disease were the villages of Puratan Jamsol, Nutan Jamsol and Pariharpur, and the colliery of Banksimulla. No cases occurred in the municipalities of Asansol and Raneegunge. Infection was imported from Jamalpur (Bihar and Orissa) to Puratan Jamsol and from thence it was carried to Nutan Jamsol.

Plague.—No case of or death from plague was reported during the year.

Malaria.—The year was remarkably free from malaria. During the third quarter of the financial year a few outbreaks were reported from some of the villages in Ondal thana, but its spread was prevented by cleansing or draining the tanks infested with malaria-bearing mosquito larvæ (*Fuliginosus* and *Culeifacies*) and by the use of quinine. The number of cases and deaths reported during the year was much below the average but accurate statistics are not available.

As usual Government sugar-coated quinine tablets were sold from the Board's office to collieries for the use of their labour. The amount of quinine sold was 1,910 treatments or 38,200 tablets of 4 gr. each as against 6,800 treatments or 136,000 tablets during the previous year.

After the publication of Major W. Acton's paper on the use of Cinchona Febrifuge in Malaria in the *Indian Journal of Medical Research*, April, 1921, arrangements were made with the quinologist, Mangpo, for a supply of cinchona febrifuge tablets through the Superintendent of Alipur Juvenile Jail for sale to collieries from the Board's office.

Influenza.—The settlement was practically free from influenza during the year, the number of deaths recorded being ninety-seven as against 529 during the previous year.

During the first month of the financial year the disease appeared in mildly epidemic form, and abated in May, and lasted with gradually decreasing incidence till the end of the financial year. No statistics are available to show the number of attacks in the villages of the settlement.

Vaccination.

During the year under report the number of vaccinators working in the Mining Settlement was sixteen, including three vaccinators entertained by the Municipalities of Asansol and Raneegunge (two

by Asansol and one by Raneegunge with grants-in-aid from the Board). The number of primary and secondary vaccinations was 13,298 and 8,680, respectively, as against 11,583 and 12,501 during the previous year, the decrease in the number of re-vaccinations being due to the gradually decreasing number of persons requiring re-vaccination.

The ratio of successful vaccination per thousand of the population was sixty-two as calculated on a population of 329,353 according to the census of 1921 as against 73.06 of the previous year.

The degree of protection afforded to every 1,000 of the infant population in rural areas was 725 against 670 of the previous year.

During the whole of the year vaccination was carried out free of charge from house to house. The attitude of the people towards vaccination was not unfriendly and no opposition of any importance was met with.

Vital Statistics.

Births and Birth Registration.—The number of births recorded during the year was 7,995, of which 4,246 or 53.1 per cent. were males and 3,749 or 46.9 per cent. females. The ratio of males born to every 100 females was 113 as against 107 during the previous year. The number of still-births reported was twenty as against twenty-nine of the previous year. The births show a decrease of 674 from those of the previous year the rate per mille being 24.3 as calculated on a population of 329,353 of the census of 1921, as against 28.05 during the previous year. The continued low recorded birth-rate is in all probability due to the unwillingness of the population to notify births to the registering agency. The low average birth-rate for the settlement (the average rate for Bengal being 30 per 1,000) was not due to defective registration as the same agency was employed as in former years.

Deaths and Death Registration.—During the year under report there were 7,255 deaths from all causes as against 8,597 during the previous year of which 3,858, or 53.18 per cent. of deaths occurred amongst males and 3,397 or 46.82 per cent. amongst females as against 53.73 and 46.27 per cent. respectively during the previous year, the death-rate of females to that of males being 114 to 100 as against 116 during the previous year. The deaths also show a decrease of 1,342 from those of the previous year, the rate per mille being 22 as calculated on the new census figures as against 27.82 during the previous year. It is a matter for great satisfaction that during the last two years the number of recorded births exceeded the number of recorded deaths.

Seven thousand two hundred and fifty-five deaths were reported during the year. The principal causes of death were as follows: Fever, 1,337; respiratory diseases, 1,295; cholera, 583; dysentery and diarrhoea, 515; influenza, 97; small-pox, 10; other causes, 3,418; total, 7,255.

Infantile Mortality.—Altogether 1,306 infants of one year and under died during the year under report. Of the 1,306 deaths, 749 occurred amongst males and 557 amongst females. As usual there were more

male births than female births and more deaths amongst male infants than amongst female infants, the death-rate of male infants compared to females being 134 to 100.

The infantile mortality-rate for the financial year was somewhat higher than that of the previous year, but the infantile mortality-rate for the settlement still continues to compare favourably with that recorded anywhere in India. As usual the Board's midwives gave free advice and attendance to the women of the settlement in their confinements and delivered house-to-house lectures on cleanliness and domestic hygiene.

Anti-Malarial Investigation.

The investigation was carried on by the same staff of investigators as reported previously. They examined ground tanks, water courses, shallow pools, cowsheds and other places where malaria-bearing mosquitoes were suspected either of breeding or harbouring in adult form.

Altogether 4,548 tanks and water courses were examined during the year, of which 630 were found to be infested with malaria-bearing mosquito larvae. Asansol thana returned the highest percentage of infestation of tanks, though the splenic index of the thana showed the amount of infection amongst the population to be one of the lowest. The infestation of Baraboni thana which returned the highest percentage last year, i.e., 26.7 per cent., with a splenic index of 4.8 per cent., was only 16.39 per cent. and 0.52 per cent. respectively during this year. It is a matter for satisfaction that by the cleansing or draining of a comparatively small number of infested tanks and water courses, the percentage of infestation and splenic index of the settlement have been considerably lowered.

The number of infested tanks and dobas drained and marshes improved during the year was seventeen and the number of tanks requiring to be cleansed of weeds was only eight as against seventy during the previous year. Representations were frequently made to the owners of collections of water found to be infested with the larvae of malaria-bearing mosquitoes either to drain them out or to cleanse them of weeds. The response was however unsatisfactory, as the public has not yet learnt to appreciate the value of anti-malarial measures, and there is no legislation at present to empower the Board to carry out such measures itself or to compel owners to do so. Through the kindness of the Director of Fisheries two species of larvacidal fish (*Haplochilus*) were introduced by way of experiment into some of the tanks of the mining settlement, and it is hoped that they may be able to be successfully cultivated for distribution to infested tanks.

Investigation into the splenic index of the population of the mining settlement was conducted during the year and it was found that the whole of the settlement was less affected with malaria during the present than during the previous year.

Eleven thousand one hundred and forty-eight children were examined for enlargement of the spleen and the splenic index for the settlement as a whole was 2.47 per cent.

Provision of Burning-ghats and Burial-grounds.

No additional burning-ghats or burial-grounds were established by the Board during the year and all burning ghats and burial places commonly used by the public were under the Board's control, and an adequate staff of domes maintained to keep them clean and in proper order. To prevent the spread of infection, cholera corpses which had been thrown into streams or improperly disposed of by burying were cremated by the Board's domes so far as the rites and usages of the different castes permitted.

Improvement of Water Supply.

The rainfall during the year being deficient, scarcity of drinking water prevailed during the closing months of the financial year in almost all parts of the settlement. Most of the collieries being provided with a sufficient number of wells did not, however, feel the scarcity. Additional wells were, where necessary, constructed by collieries in accordance with the plans recommended by the Board.

The villages and municipalities of the settlement suffered much from the scarcity of water. On the recommendation of this Board the Asansol Local Board constructed twenty-five 6 ft. diameter wells in twenty-five villages of the settlement during the year. At present the number of villages in the settlement possessing local board wells is 188, and it is hoped that within a few years all the villages of the settlement will be provided with wells, and the scarcity of drinking water during the hot seasons considerably lessened.

During epidemics of cholera tanks were, with the owners' permission, reserved under the Epidemic Diseases Act in almost all the villages of the settlement either for bathing or drinking, and contaminated water supplies were sterilized and guarded at the Board's expense.

Education of the Public.

As usual the sanitary assistants of the Board delivered weekly lectures in the lower and upper primary schools of the settlement on hygiene and public health, and the midwives paid house-to-house visits and delivered simple lectures on the general principles of cleanliness and domestic hygiene to the women of the settlement. In epidemic times the sanitary inspectors also delivered lectures in the collieries and villages of the settlement on the prevailing epidemic illustrated with magic lantern slides. The chief sanitary officer's Primer on Elementary Hygiene in Bengali was also distributed free of cost to the scholars in the schools of the settlement, and the Director of Public Instruction, Bengal, has been approached to have the primer recognized by the Education Department as a text-book for use in the lower primary and upper primary schools of Bengal.

HOO KWORM.

Throughout the period under review the investigation into the existence of hookworm diseases in the Mining Settlement begun by the Board, was continued by the Government of Bengal under the supervision of the chief sanitary officer.

The total number of persons examined for hookworm was 5,689, of which 3,398 or 59.72 per cent. were found to be infected. Thymol 60 gr. in powder, in two 30-gr. doses, followed by Epsom salts, was administered in a certain number of cases, both microscopically positive and negative, to confirm the accuracy of the microscopic investigation. Clayton-Lane's "levitation" method was followed in the microscopic examination of stools. The average hæmoglobin index of those negative was 80 per cent., and of those positive 66.5 per cent.; 31.33 per cent. of the worms passed were *Ankylostoma* and 68.67 per cent. *Necator americanus*. No case found negative microscopically was subsequently found positive on the administration of thymol and vice-versa. The average number of the worms found per infected individual was twenty-one in collieries, five in villages, and three in municipalities. The percentage of infection found in collieries was 68.85 per cent., in villages 37.09 per cent., and in the municipalities 18.56 per cent. The percentage of mines found infested was 83.20. As has been pointed out by other investigators, a ready means of estimating the percentage hookworm infection in a community is afforded by the hæmoglobin index, due regard being had at the same time to the concurrent existence of malaria and other blood-destroying diseases.

The abolition of hookworm disease in the mining settlement as elsewhere depends on the education of the masses in the elementary principles of hygiene.

RULES FOR SANITATION AND CONSERVANCY IN MINING SETTLEMENTS FOR THE TAKING OF MEASURES TO PREVENT THE OUTBREAK OR SPREAD OF EPIDEMIC DISEASE AND TO REGULATE THE DUTIES AND POWERS OF SANITARY OFFICERS.

The Board may provide and may maintain burning-ghats and burial-grounds and may approve burning-ghats and burial-grounds maintained under the provisions of section 6 or by any person.

In the whole or in any specified part of the mining settlement in which the board maintains or has approved public burning-ghats or burial-grounds, the board may, by general or special order, direct that—

(1) No person shall convey a corpse or part of a corpse along any road unless it is decently covered and totally concealed from view.

(2) No person while conveying a corpse shall, except for the purpose of ordinary relief or for a religious purpose, deposit it on or near any road.

(3) No person shall, without the general or special permission of the chairman or, in his absence, two members of the Mines Board of Health, dispose of any corpse otherwise than by burying or burning it at a place maintained or approved by the Mines Board of Health for such purpose.

(4) No person shall in any burial-ground bury or cause to be buried any corpse in a grave not constructed of masonry, unless the top of the coffin or (if no coffin be used) the corpse is placed at least four feet below the surface.

(5) No person shall in any burial-ground bury or cause to be buried any corpse in a grave not constructed

of masonry unless the grave is at least 4 ft. deep.

(6) No person shall build, or dig, or cause to be built or dug, any grave in a burial-ground at a distance of less than 3 ft. from any other existing grave.

(7) No grave once used shall be opened for the burial of another corpse without the general or special permission of the Mines Board of Health.

(8) Any person burning or causing to be burnt any corpse at any burning-ground or burning-ghat shall cause the corpse and the clothes and other articles brought with it to be reduced completely to ashes.

(9) Any person who conveys or causes to be conveyed any corpse to any burning-ground or burning-ghat shall burn the same or cause it to be burnt within six hours after its arrival at such ground or ghat.

The Board may issue a written order on any mine owner, manager, or landholder directing him to close or empty within a time to be stated in the order, and for such time as may be specified therein any well, tank or other source of water supply situate within or partly within his property which, in the opinion of the chief sanitary officer is contaminated, and, in the event of the work not being carried out within the time stated in the order or to the satisfaction of the chief sanitary officer, the Board may itself carry out the work.

The powers granted by this rule may be delegated by the Board to its chief sanitary officer.

The Board may delegate to its chief sanitary officer power—(a) to seize and destroy any articles of food or drink which in his opinion are unfit for consumption; (b) to seize and dispose of the corpse of any person who he has reason to believe has died of any epidemic disease.

The Board may issue a written order on any mine owner, manager or landholder directing him to carry out, within a time to be stated in the order, such measures for the disinfection or evacuation of dwelling-houses, or for the destruction of infected bedding or clothing as the chief sanitary officer may consider necessary, and in the event of such measures not being carried out within the time stated in the order, or to the satisfaction of the chief sanitary officer, may authorize the chief sanitary officer to carry out the work.

The power granted by this rule may be delegated by the Board to its chief sanitary officer.

The Board may, during the prevalence of an epidemic, direct that any market shall remain closed for such time as may appear to be necessary.

The power granted by this rule may be delegated by the Board to its chief sanitary officer.

"The Board may establish a vaccine station at any place, and may appoint vaccinators and the establishment necessary for the same, and incur expenditure for the payment of salaries and the purchase of lymph."

The previous sanction of the Local Government shall be required for the exercise by the Board within any prescribed area within the mining settlement of all or any of the following powers and functions.

The Board may provide establishments, cattle, carts and implements required for the removal of sewage,

offensive matter and rubbish and may provide places convenient for the deposit thereof by occupiers of houses.

Where such places have been provided, the board may require the occupiers of houses to deposit the same daily or at stated intervals in such places.

Where such places have not been provided, the Board may require every occupier of any house or land to place rubbish at stated hours on the public road adjacent to his house or land.

All drains, privies and cesspools shall be subject to the inspection and control of the Board.

The Board, or any officer authorized by it in that behalf, may inspect all privies, drains and cesspools at any time between sunrise and sunset, after two hours' notice in writing to the occupier of any premises in which such privies, drains or cesspools are situated, and may, if necessary, cause the ground to be opened wherever the Board, or the officer authorized by it, may think fit for the purpose of preventing or removing any nuisance arising from such privies, drains or cess pools.

Whenever the Board is satisfied that the existence of such privy, drain or cesspools is attended with risk of disease to the inhabitants of the neighbourhood, it may direct the use of such disinfectants or deodorants as it shall specify, in such privy, drain or cesspool, in such quantities or for such time as it shall think fit.

The Board may provide and maintain common privies or urinals.

Whenever any land, being private property or within any private enclosure, appears to the Board by reason of thick or noxious vegetation or jungle, or inequalities of surface, to be likely to impede sufficient ventilation or to be otherwise injurious to health, or by want of drainage to be in a state injurious to health, or offensive to the neighbourhood, the Board may require the owners or occupiers, or the owners and occupiers of such land, within fifteen days, to clear and remove such vegetation or level such surface or drain such land. Provided that if, for the purpose of effecting any drainage under this rule, it shall be necessary to acquire any land not being the property of the person who is required to drain his land, or to pay compensation to any other person, the Board shall provide such land and pay such compensation.

All existing public sewers, drains and other conservancy works shall be under the direction and control of the Board, who may construct such further works of that nature as they may consider necessary.

The Board may, by order published at such places as it may think fit, set apart any well, tank, part of a river, stream or channel, not being private property, for the supply of water for drinking and for culinary purposes and may prohibit therein all bathing, washing of clothes or animals or other acts calculated to pollute the water, and may similarly set apart any well, tank, part of a river, stream or channel for the purpose of bathing, or for the purpose of washing animals or clothes or for any other purpose connected with the health, cleanliness or comfort of the inhabitants of the mining settlement.

The Board may, by an order published at such places as it may think fit, prohibit in the private

portion of any stream or channel used as part of the public water-supply bathing, washing of clothes or animals or any other act likely to pollute the water in the public portion of such stream or channel.

If the chief sanitary officer of the Board certifies that the water in any well, tank or other place is likely, if used for drinking, to engender or cause the spread of any dangerous disease, the Board may prohibit the removal or use of such water for drinking during a period to be specified in the notice.

The Board may require the owner or occupier of any land within eight days, or such longer period as the Board may fix, either to re-excavate or fill up with suitable material, at his option, or to cleanse any well, watercourse, private tank or pool therein, and to drain off and remove any waste or stagnant water which may appear to be injurious to health or offensive to the neighbourhood: Provided that if, for the purpose of effecting any drainage under this section, it shall be necessary to acquire any land not being the property of the person who is required to drain his land or to pay compensation to any other person, the Board shall provide such land and pay such compensation.

The Board may require the owners or occupiers, or the owners and occupiers of any land, within fifteen days to repair and make efficient any drain, privy or cesspool, or to remove any privy or close any cesspool which is situated on such land.

If any person, without the written consent of the Board first obtained, makes or causes to be made, or alters or causes to be altered any drain leading into any of the sewers or drains vested in the Board, the Board may cause such branch drain to be demolished, altered, re-made, or otherwise dealt with as they shall think fit.

If any land, being within 100 ft. of a sewer, drain or other outlet into which such land may, in the opinion of the Board, be drained, is not drained to the satisfaction of the Board, the Board may require the owner, within one month, to drain the said land into such sewer, drain or outlet.

No person shall, without the written permission of the Board construct or keep any latrine, urinal, cesspool, house-drain, or other receptacle, for sewage or other offensive matter, within 100 ft. of any public tank or watercourse or a tank or watercourse which the inhabitants of any locality use.

The Board may require any owner and occupier upon whose land any latrine, urinal, cesspool, house-drain or other receptacle so situated exists, or may hereafter be constructed, to remove the same within eight days.

No person shall, within the written permission of the Board, construct a privy with a door or trap-door opening on to any road or drain. The Board may require any owner or occupier upon whose land any such privy exists to remove the same within eight days.

The Board may, by a general order, prohibit the making of excavations for the purpose of taking earth or stone therefrom, or for the purpose of storing rubbish or offensive matter therein, and the digging of cesspools, tanks or undrained excavations without special permission previously obtained from them.

Colonial Medical Reports.—No. 156.—Asansol (continued).

If any such excavation, cesspool or tank is made after the issue and publication of such order, without such special permission, the Board may require the owners and occupiers of the land on which such excavation, cesspool or tank is made, within two weeks, to fill up such excavation.

Whenever the Board is satisfied, from inspection, or by report of competent persons, that any existing block of huts within the mining settlement is, by reason of the manner in which the huts are constructed or crowded together, or of the want of drainage and the impracticability of scavenging, attended with risk of disease to the inhabitants of the neighbourhood, they may cause the locality to be inspected by two medical officers, who shall make a report in writing on the sanitary condition of the said block of huts; and shall specify, if necessary, in the said report, the huts which should be removed, the roads, drains, and sewers which should be constructed and

the low lands which should be filled up, with a view to the removal of the said risk of disease.

On the receipt of the said report, the Board may require the owners or occupiers of the huts, or at the option of the Board, the owner of the land on which such huts are built, to carry out and execute, within a reasonable time, to be fixed by the Board for such purpose, all or any of the works specified in the aforesaid report or any portion thereof respectively, and if such owner, owners or occupiers shall fail to comply with such requisition, the Board itself may execute all or any of such works.

Every owner, or occupier, or farmer, of any place for the sale of meat, poultry, fish or vegetables, or of any slaughter-house, within the limits of the mining settlement shall cause such drains to be made therein as shall be considered sufficient by the Board and (if required so to do by the Board) shall cause all the floors and drains to be paved with stone or burnt brick, and shall also cause a supply of water to be provided, sufficient for keeping such place or slaughter-house in a clean and wholesome state.

Colonial Medical Reports.—No. 157.—Queensland.**ANNUAL REPORT OF J. I. MOORE, COMMISSIONER OF PUBLIC HEALTH FOR QUEENSLAND, TO JUNE 30, 1922.****STATISTICAL.**

QUEENSLAND still holds a favourable position in respect to the crude birth-rate per 1,000 of the estimated mean population, which amounted to 64.665 persons for 1921.

The improved record in the infantile mortality rate is most pleasing, and is largely due to the good effects attained through the active steps taken by the Government in providing baby clinics as well as propaganda in educating young mothers in the care and upbringing of infants. This has naturally brought about a marked saving in infant life and which can be traced to a better knowledge of hygiene, infant feeding, as well as advisory precautions taken by expectant mothers.

COMMUNICABLE DISEASES.

During the year 3,176 cases were notified, and this number, in contrast with that for the preceding twelve months—i.e., 4,787—shows a very healthy comparison.

Diphtheria shows the most prominent falling off in numbers of any of these diseases, and this pleasing feature is due mainly to insisting on three negative swabbings being obtained before the required discharge of the patient or carrier is permitted, thus eliminating to a negligible quantity the spread of the disease among others. The falling off is also due to the fact that clinical cases are not counted unless bacteriologically confirmed, as in

the past suspicious cases, which frequently were negative of diphtheria, were recorded as true cases.

Typhoid fever cases show a pleasing reduction in comparison to last year's figures, being 366 for 1921-22 as against 522 for 1920-21. The decrease in the number of cases is regarded as being mainly due to prophylactic measures as well as improved sanitary conditions in respect to fly-proof pansteads, the protection by screening of foodstuffs against the access of the fly, which is generally recognized as the chief agent for the transmission of the disease, and the strict enforcement of the typhoid fever regulations. At places having an unenviable record in the past, through improvement in the directions mentioned above, a satisfactory health report is now recorded.

Pulmonary Tuberculosis.—During the year the Medical Officer, Central Tuberculosis Bureau, in his report, mentions that in seventy-seven cases examined by him for entrance to a sanatorium forty-six were found suitable, whilst twenty-six were passed to the Diamantina Hospital and five were sent to Dunwich.

For the year there were 184 out-patients entailing 268 consultations; those unable to attend as out-patients or who could not afford private medical attendance were visited at their own homes. The total number of cases notified within the metropolitan area was 227, from outside areas 291; of the former twenty-five were military cases notified

from a Red Cross convalescent home, whilst included in the outside areas were ninety-one cases from the Repatriation Sanatorium, Stanthorpe; the increase in the number of cases as compared with those for last year being due to the military cases.

The staff nurse of the department visited some 164 cases, when the usual investigations were made concerning the condition of the patient and advice given as to precautionary measures to be observed in safeguarding the health of the other members of the family.

Seven hundred and twenty-five specimens of sputum were examined, of which 193 proved positive.

The number of notifications of ancylostomiasis received during the last twelve months was 107, as against ninety-two from the previous year. The 107 cases reported include ninety-four from the Hospital for the Insane at Goodna, thus leaving only thirteen cases reported from other parts of the State.

During the past year the Hookworm Campaign examined a total of 48,197 persons. Of this number 5,846 were found to be suffering from hookworm disease, and 5,754 have received treatment. The work of the campaign has embraced almost the entire State, and demonstrates that the infection is limited to the areas of higher rainfall in the far north and along the eastern seaboard. The interior of Queensland is free from locally contracted hookworm disease.

An interesting feature of the work of the past year has been the examination of certain coal mines. A high rate of infection has been found in the miners of two districts, and with the co-operation of the Mines Department steps have been taken to prevent underground soil pollution, which has been responsible for these high rates, and to reduce the chances of infection by persuading miners to wear boots.

The campaign has placed special emphasis as regards improvement of sanitary conditions in the communities visited.

As hookworm disease is spread largely by soil pollution, its control is to a considerable degree dependent on sanitary improvement in respect to latrines, and this also is essential in the prevention of other diseases such as typhoid fever, which may be spread through the improper disposal of human faeces.

The Hookworm Campaign, in its endeavours to secure fly and rodent proof privies, has acted as a strong influence in securing general public health improvement.

Plague.—It is with regret that this year's report has to record an account of an unfortunate outbreak, which first revealed itself in humans on August 23, 1921, and lasted until April 6, 1922.

The number of cases in humans in the metropolitan area amounted to fifty-seven, of which twenty-eight proved fatal, whilst from outside centres fifty-seven cases were reported with thirty-six deaths, making a total throughout the State of 114 cases and sixty-four deaths.

The death-rate in Brisbane was 49.12 per cent., but as three cases occurred amongst Chinese, who all succumbed, the corrected rate for whites is therefore 46.29 per cent. The death-rate outside of the metropolitan area was 63.1 per cent.

The first case of plague in humans occurred at Brisbane in August, 1921, when the patient died on the 23rd; post-mortem examination revealed *Bacillus pestis* in the specimens, whilst the second case followed in the succeeding month, and occurred in the area where the first case resided and proved fatal. Both these patients died at their own homes. The third case, a boy, aged 5 years, was removed on September 30 to Lytton Isolation Hospital, where he remained till October 11, when he was transferred to Wattlebrae Isolation Hospital.

The highest number of cases in humans occurred during the months of October, November, and December, when a marked decrease followed during January, February, and March.

The reason advanced for the cessation of the disease is attributed to the activity displayed by the Government and local authorities in enforcing the general cleanliness of premises and the systematic destruction of rodents and fleas.

The incidence of plague at northern seaport towns may be attributed to infected rats being carried in the cargo per medium of ships. It will be noted that the highest number of rats destroyed corresponded with the period when the highest number of cases in humans occurred.

The first plague-infected rodent was obtained from a wharf at Cairns on August 31, 1921, and received at this Department's laboratory on September 13, and this was followed by the finding of four infected rats in a bag and bale store at South Brisbane on September 6.

The last infected rodent in the State during the period under review was found in the metropolitan area on April 26, 1922, about twelve miles from the city, the smear being examined at this Department's laboratory on April 28, 1922.

The total rodents recorded as destroyed in the metropolitan area from the commencement of the rodent-destruction campaign on August 30, 1921, to June 30, 1922, was 116,476, of which number 109,798 were examined, and of these 186 were found plague-infected; 172 cats were examined, of which number five proved positive of *B. pestis*, one of which was obtained from Brisbane and four from the South Brisbane City Council's area.

Two pigeons, one fowl, four dogs, and twenty-three guinea-pigs were also submitted to this Department's laboratory for examination, but all proved negative of *B. pestis*.

Rodents and smears were examined at the Department's laboratory, Brisbane, from outside areas.

In addition, Dr. Breinl, Townsville, reported that he examined 1,391 smears, by arrangement on behalf of this Department, from Hinchinbrook Shire from December 5, 1921, to June 30, 1922, three of which revealed the presence of *B. pestis*. He also examined 382 rodents from Townsville City Council

since November 8, 1921, all of which proved negative.

An infected rat was also obtained from Port Douglas, and was examined at the Commonwealth Laboratory, Cairns, on November 23, 1921, thus making a total of eight areas outside Brisbane in which plague in rodents was detected.

During rat-destruction operations four rats were found at the Enoggera Remount Depot to be plague-infected. The premises were disinfected and all rats destroyed, after which sentinel guinea-pigs were placed in the buildings so as to ascertain whether plague-carrying fleas were present. Subsequently, three guinea-pigs on various dates succumbed to the disease on the premises referred to, whilst a fourth, when removed to the Department's laboratory, was also found to be infected. This is worthy of special note, showing as it does that the flea carries the bacillus even after the infected rat has been destroyed; in fact, it is claimed that the flea remains a source of danger for about twelve to thirty days after it has left the rat, which occurs immediately the rat cadaver loses its warmth.

Rosenau, in 1921 edition "Preventive Medicine and Hygiene," writes on the subject as follows: "The development of plague bacilli in the flea as well as the activity of the flea itself is restricted both in very hot and very cold weather. Extremes of temperature are, therefore, not favourable for the spread of the bubonic form of the disease. The pneumonic form spreads best when the weather is very cold."

A total of 119 guinea-pigs was used as sentinels in the metropolitan area during the period under review. Guinea-pigs were placed on fifty-six premises from which infected rodents or cats had been obtained, or at which a plague or suspected plague case resided or was employed. Ten of the guinea-pigs on examination revealed the presence of *B. pestis*.

In every case the premises from which infected sentinel guinea-pigs were obtained were those on which an infected rodent or rodents had been found.

Included in the total sentinels used are two guinea-pigs which were placed on certain premises in the city (from which infected rodents were not obtained) to ascertain if such were free from plague fleas and also three from the Federal Quarantine Service.

Fleas investigation undertaken from January 9, 1922, to June 30, 1922, resulted in 191 fleas being collected from rats and sentinel guinea-pigs, all with negative results.

The Epidemic Diseases Regulations were gazetted on September 21, 1921. Additional powers were provided on September 30, in the shape of Plague Regulations for the Control of Goods Traffic. This measure was taken with a view to preventing infected rodents being carried to clean areas. With this in view, a special squad of supervisors was appointed, whose functions were to see that all goods leaving the metropolitan area for outside places were rendered rat-proof, and that no goods from infected premises were removed unless under

special conditions provided in the Regulations. The Commonwealth authorities undertook to safeguard in a similar manner goods leaving an infected area by sea as well as supervision of goods crossing the border into New South Wales, and similar action was taken in respect to this State by the Commonwealth when plague became existent in New South Wales.

On December 2, 1921, new Regulations embodying the Model Regulations approved of by the Commonwealth and States of Australia Plague Conference, held at Sydney in November, 1921, were brought into force throughout the State and which repealed the Rat and Mosquito Prevention and Destruction Regulations of 1916. These regulations were amended on January 4 and 19, 1922, to increase the penalty for scattering waste food on roads, and also for the proper handling of hotel counter lunches, and to provide further power *re* flea destruction, prohibition of foodstuffs at places of amusement, recoupment by occupiers from owners of moneys spent by them to comply with the regulations, and the advertisement and sale of disinfectants, pulicides and drugs, &c., as plague combatants.

In the metropolitan area it was decided that active measures should be undertaken to deal with plague, and with this end in view the Metropolitan Joint Health Board was brought into existence.

The Board's functions were the superintendence, execution and enforcement of "The Rat, Flea and Plague-carrying Insects Prevention and Destruction Regulations of 1921."

The services of a number of the Department's inspectors were made available to the Board for the carrying out of house to house inspection, the supervision of rat destruction and rat-proofing of premises, spraying public places of amusements, &c., systematic spraying of premises within certain areas, and general cleansing measures, which work was performed by a squad of men specially employed in the above connection. In addition the services of the Department's rat gang were made available.

The Education Department was approached with a view to securing its co-operation in requesting school children to clean school premises of any scraps of food likely to attract rats.

Proprietors of places of public amusement were also compelled to see that their patrons did not bring in foodstuffs, and failure in this respect rendered their premises liable to be placed under an embargo.

General Diseases.—During the year 2,150 notifications were received.

The 1920-1921 figures included eleven cases notified as gonorrhoea and syphilis, three cases notified as gonorrhoea and soft chancre, and one reported as syphilis and soft chancre, making the total patients notified 2,287.

Four hundred and forty-eight male patients attending the Brisbane clinics were notified for failing to report themselves at least once in every four weeks, as required. Of these, 418 were written to and warned of the consequences of their action,

with the result that 205 reported back to the clinic or official advice was received that they were again under medical treatment for the disease. Four were written off as having left the State and replies were awaited from eighteen at June 30, 1922. The services of the police were requisitioned in respect of the balance.

Nine of the patients who did not comply with the warnings given them were proceeded against, and fines ranging from £2 to £5 and costs were obtained.

Four of the women attending the female clinic were written to during the year for failing to continue medical treatment, with the result that three again reported and obtained certificates of cure, whilst the other transferred to another medical practitioner, from whom the requisite official advice was received. Another woman, who had been written to in the previous year, was warned by the police, and on reporting was found to be free of the disease and was given a certificate of cure.

Two hundred and ninety-one certificates of cure were issued in the clinics, of which number 251 were male patients.

Patients are taught to irrigate and advised to obtain the necessary appliances for home use, so that their visits to the clinic for this purpose become obviously fewer.

At the Venereal Isolation Hospital, Park Road, South Brisbane, eighty-nine women were treated during the year, seventy-two of whom were prostitutes committed under "The Health Acts, 1900-1917," sixteen were prostitutes remaining over from the preceding year, and one was a woman who voluntarily sought admission. Eighty-six of the patients have been discharged as no longer infectious, including two who escaped from the institution and were then committed to Brisbane Jail; the remaining three are still inmates.

Ten prostitutes were detained under the section of the Acts above referred to for treatment at centres outside the metropolitan area. In addition to six of the above, the four females referred to in last year's report as being under treatment at outside centres were discharged as no longer infectious.

Two hundred and seventy-three Forms H. were served on prostitutes by the police. One prostitute was convicted and fined 2s. 6d. and costs for non-attendance at the rooms.

During the year under review salvarsan preparations were issued as hitherto to all hospital patients unable to pay hospital fees free of charge conditionally upon an accompanying History Sheet being completed by the medical officer and submitted to the Commissioner; patients who were in a position to pay hospital fees were required to remit 5s. per dose, and it is noteworthy that only 5s. was received during the year in this connection, and that for a dose supplied in June, 1921.

Epidemic Polio-encephalitis.—Although this disease has not been gazetted as notifiable under the Health Acts, it was deemed necessary, in view of the high percentage of cases that came to my knowledge, to circularize the medical practitioners throughout the State. The cases appeared spas-

modically and not in any special areas, and extended from the south to the central districts.

The death roll amounted to forty-nine out of some seventy-five cases reported, giving a death-rate of 65.3 per cent. This disease is an acute inflammation of the grey matter of the brain, and is due to a micro-organism.

Sanitation.—The chief sanitary inspector has had to curtail to a large extent the operations of the metropolitan staff, especially in respect to outside places, yet, on the other hand, their services have been specially utilized in respect to plague in carrying out house to house inspections, rat destruction, and rat-proofing work, and these duties have more than claimed a fair quota of the time of this branch.

Matters affecting drainage, sanitary conveniences, inspection of sanitary depots, and miscellaneous inquiries have also been given close attention.

Peel Island Lazaret.—During the past year eight new patients were admitted to the lazaret, consisting of four white and three coloured males and one white female. Three deaths amongst coloured males occurred during the year, whilst no patients were discharged.

The health officer who visits the lazaret reports that the treatment is still chaulmoogra oil in capsule form, hydriocarpate of soda in tabloid form by the mouth, and hydriocarpate of soda in capsules or injections twice weekly.

It is pleasing to record the fact that everything possible is done to alleviate the sufferings of the inmates, as well as to enter for their amusement. Tennis, gramophones, &c., are at their disposal, and a piano was kindly donated by the masonic fraternity.

The Government twice a year issues two free railway passes to and from their place of residence to one relative of each inmate. In addition, the Government steamer *Offet* is at the disposal of relatives and friends to visit the lazaret island, and this is supplemented for distant relatives by the use of a launch via Cleveland, the nearest mainland to the lazaret.

Divine services are held periodically by clergymen of various denominations, at which the inmates generally attend.

The patients are encouraged, for health reasons, to undertake light work, and with this end in view prizes were offered for the best kept parterres, and this inducement created a keen spirit of competition which resulted in the brightening up of the patients' cottages.

In addition, an opportunity is afforded to willing workers to earn wages in return for services rendered, with the result that many of those who are physically capable of working have now quite respectable banking accounts.

It has been the policy of the department to afford patients, particularly those showing signs of improved conditions, an opportunity to undertake remunerative work, so that on discharge they will not find themselves without the necessary funds whilst awaiting suitable employment. In fact, some of the inmates are in the happy position of being able to render assistance to needy relatives.

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Employment being the keynote to contentment, it naturally follows that the inmates who are fully occupied in congenial work are brighter, healthier, and infinitely more hopeful of obtaining discharge than those who are disinclined to follow the good example set them by others.

Nurses' Registration Board.—Registrations were granted to 108 nurses in the general section, forty-six in the midwifery section, and fifty in the mental section, making the total registrations by examination 200.

Under the concessional clause of the Health Acts the Home Secretary granted registrations to persons who were following the calling of a nurse during 1909, 1910 and 1911, as follows: General, 6; midwifery, 13.

Port Douglas was appointed a special general centre for the September, 1921, examination, to enable a candidate to sit for one paper in which she had previously failed. Maryborough, Taroom, and Nanango also received similar consideration for the March examination for general nurses. Maryborough was made a special examination centre for midwifery nurses for the March examination.

Oral and practical examinations for nurses were conducted at outside centres by members of the medical and nursing professions.

During the year two cases of grave misconduct by State registered nurses have come under notice, with the result that in one case cancellation of registration followed, whilst the other is still receiving consideration.

REPORT OF HEALTH OFFICER.

The most prevalent communicable diseases during this period in the metropolitan area with which I have had occasion to deal were: Diphtheria, typhoid fever, scarlet fever, influenza, epidemic polio-encephalitis, plague.

The number of cases of diphtheria was 550, as compared with 1,105 for the year 1920-21.

Typhoid Fever.—There were no serious outbreaks in the metropolitan area during the year. There may be mentioned one interesting series of cases which occurred in the Brisbane General Hospital amongst the staff of the hospital. Two medical men and four nurses contracted the disease whilst nursing surgical cases. It was found on investigation that two male surgical cases under treatment for surgical conditions were typhoid carriers and caused the outbreak. These two patients subsequently gave negative results, and no further cases amongst the staff occurred.

Scarlet Fever.—Three small outbreaks amongst schools were investigated and the cause traced; no further cases took place in these schools.

Influenza.—This disease is now only notifiable from certain coastal cities and towns in Queensland. There were 175 cases notified. These included about eight pneumonic cases, seven of whom died, five at Sandgate and two in North Brisbane.

Epidemic Polio-encephalitis.—This disease has occurred on a moderate scale for some years past in

Queensland. Ipswich and Lowwood were visited by me to investigate the disease, and the co-operation of medical men all over Queensland was asked by circular, and through the Press, in notifying any cases occurring in their practice. The response brought to the notice of the department seventy-five cases. This disease caused some considerable panic in some of the affected districts. All precautions were taken, and a good rainfall helped to finish the disease towards the end of May. There were forty-nine deaths. These cases occurred in young children from 1 year up to 14 years and 10 months. No cases in adults were reported.

Plague.—The first case occurred at Red Hill. The patient was a man 41 years of age, who worked in a grain and produce store in Roma Street. Cases continued to occur from time to time until the middle of March, 1922.

There were two cases of pneumonic plague, which were attended with the strictest precautions. Both patients died. No further cases occurred.

Peel Island Lazaret now contains fifty-five patients. The treatment is still chaulmoogra oil in capsule form, hydnicarbate of soda in tabloid form by the mouth, and hydnicarbate of soda in ampoules for injections twice weekly.

R. W. TELFORD, *Health Officer.*

Owing to the occurrence of plague during the year, the appointment of a temporary plague staff was found to be necessary, as the ordinary staff was unable to successfully cope with the increased work.

Plague.—The number of rodents examined for plague was very great, especially during the six months after the outbreak began.

Over 100,000 rodents were examined, and of these 185 were found infected.

Of 172 cats examined, very nearly 3 per cent. were infected. All other animals—dogs, guinea-pigs, pigeons, and fowls were negative.

Diphtheria.—The number of suspected cultures submitted for examination was less than half the number submitted last year.

JOHN J. HARRIS, *Director.*

Plague prosecutions totalling ninety-seven were during the year successfully conducted against individuals and firms acting in contravention of the regulations, and fines and costs imposed totalled £259 5s. 6d.

HEADQUARTERS STAFF.**Food Prosecutions.**

Spirits.—Seven persons were prosecuted for selling adulterated spirits during the year, a conviction being obtained in each case.

Milk.—Ten persons were proceeded against for selling milk adulterated with added water. All were convicted. In addition to the above, one milk vendor was charged with selling milk deficient in fat, and fined.

Miscellaneous Prosecutions.—Thirty-one indivi-

duals were prosecuted, principally in connection with improper handling of food for sale and for failing to protect food from contamination. A conviction was secured in each instance.

SPECIAL INVESTIGATIONS (ANTHRAX).

Arising out of an inquiry made at the latter end of the preceding year into a fatal case of anthrax occurring in Brisbane, ninety-seven packages (each containing one dozen) shaving brushes were destroyed by fire under the supervision of an officer of this department.

In January of the present year, acting upon information received from the Federal Department of Health relative to the presence in Queensland of a quantity of shaving brushes which had formed portion of an anthrax-infected shipment from Japan, one of which was responsible for a case of anthrax in Victoria, a careful investigation was made by this department, with the result that eight and eight-twelfths dozen brushes of the implicated consignment were traced and recovered from various quarters of the State and destroyed by incineration.

H. W. PETHERICK, *Chief Food Inspector.*

APPENDIX E.

The Regular Inspectorial work has been considerably interfered with due to the visitation of bubonic plague to the State.

Metropolitan Area.—The work of coping with the continued flow of complaints has been fairly heavy, owing to the reduced staff at my command. In all cases where action was deemed necessary the local authority concerned was notified, either by letter or notice, and re-inspections made when time permitted to see that requirements were complied with.

Drainage.—The construction of street water-channelling is proceeding slowly but surely in all suburban districts of the metropolitan area.

A number of local authorities have shown great activity in the construction of storm water sewers in reinforced concrete, and a great improvement has been effected in many districts.

Plague Operations.—The whole of the department's rat men were withdrawn from their regular rounds on August 30, 1921, and mobilized into one gang for the purpose of dealing with the outbreak. The gangs were increased in numbers, and at the direction of this department were placed in localities which were suspected or likely to prove infected spots.

In nearly every instance the "focus" selected proved a correct anticipation. These operations proved very successful, and a marked diminution in the number of plague-infected rats caught was noticeable, proving that the situation had been gripped and was well in hand.

The number of rodents submitted for examination while the work was under the department's supervision amounted to 22,350; 150 of which were found to be plague-infected.

"The Control of Goods Traffic Regulations," which came into force as a consequence of the plague outbreak, were administered by the officers of this department. An extra amount of work was thus entailed in controlling the output of merchandise in a rat-free condition from premises of firms where plague in humans or rodents had occurred. These regulations were carried out without friction or trouble, due to the helpful co-operation extended by the business community.

JOHN SIMPSON, *Chief Sanitary Inspector.*

Colonial Medical Reports.—No. 158.—Sierra Leone.

ANNUAL MEDICAL AND SANITARY REPORT FOR SIERRA LEONE FOR THE YEAR ENDING DECEMBER 31, 1921.

PUBLIC HEALTH.

THERE was a mild outbreak of smallpox between April and June, during which period thirty-one cases were reported with one death. Dysentery showed a marked decrease. It is satisfactory to report that it has almost disappeared from the Free-town Prison.

Helminthic Diseases.—Are almost universally prevalent, the most important being ankylostomiasis. One hundred and eighteen cases were recorded from various stations. A special investigation into the prevalence and best methods of treatment of this disease is being conducted, but the facilities for a comprehensive investigation in this Colony are meagre.

The method of treatment adopted in the Colonial

Hospital is chiefly that by the administration of oil of eucalyptus and in the prison by thymol or beta-naphthol, or both. All the methods appear to be efficacious. Treatment by a concentrated infusion of quassia is being tried, and, if it proves a success, will be a safer and less expensive method.

The health of the Free-town prisoners was, for part of the year, most unsatisfactory.

There was an attack of beriberi, which caused three deaths out of a total of forty-one cases. Active measures were taken to suppress this outbreak with success (the prison now being free from the disease) by providing a special diet scale and every effort made to supply the vitamins which, apparently, were lacking, while a number of cases

RETURN OF DISEASES AND DEATHS OF EUROPEANS IN 1921 AT THE HOSPITAL OF BOTH
IN- AND OUT-PATIENTS, AT

Sierra Leone.

GENERAL DISEASES.

	Admis- sions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	1	1	6
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	6	—	6
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	2	—	6
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	1	—	10
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	2	—	2
Kala-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	—	—	—
(b) Anæsthetic	—	—	—
(c) Mixed	—	—	—
Malarial Fever—	104	1	198
(a) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	9
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	4	—	4
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	—	—	—
Other Diseases	24	1	24
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	—	—	—
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	3	—	5
(a) Primary	—	—	—
(b) Secondary	—	—	—
(c) Tertiary	—	—	—
(d) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(a) Phthisis Pulmonalis	—	—	—
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

GENERAL DISEASES—continued.

(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	2	—	4
Circulatory System	9	9	—
(a) Valvular Disease of Heart	—	—	1
(b) Other Diseases	—	—	—
Digestive System—	—	—	—
(a) Diarrhœa	2	—	17
(b) Hill Diarrhœa	—	—	—
(c) Hepatitis	1	—	1
Congestion of Liver	—	—	—
(d) Abscess of Liver	—	—	—
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	—	—	—
(g) Cirrhosis of Liver	—	—	1
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	87	1	87
Ear	4	—	4
Eye	1	—	1
Generative System—	—	—	—
Male Organs	—	—	6
Female Organs	1	1	1
Lymphatic System	5	—	10
Mental Diseases	3	—	3
Nervous System	—	—	—
Nose	1	—	11
Organs of Locomotion	—	—	61
Respiratory System	2	—	37
Skin—	2	—	30
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	1	—	15
(d) Favus	—	—	—
(e) Eczema	—	—	2
(f) Other Diseases	—	—	—
Urinary System	—	—	5
Injuries, General, Local	11	1	48
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	—	—	6
Ascaris lumbricoides	—	—	1
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duo- denale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tapeworm	—	—	—
Poisons—	1	—	1
Snake bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	1	—	1
(c) Other Eye Operations	—	—	—

were transferred to Kissy for a time with great benefit. A point of interest was the fact that the water in which the prisoners' rice was boiled used to be thrown away. This practice was stopped and the rice water used to make their soup. Unpolished rice is used exclusively. The cooking is done by steam under pressure, and it was thought that, possibly, the food was being cooked at too high a temperature for the vitamins to remain active. Cooking at a lower pressure was therefore practised. Whether both these factors or one were responsible it is difficult to say, but the disease soon disappeared from the prison.

There was a total of twenty-five deaths during the year, and eleven of these occurred during June, July and August, viz., at the height of the rains. This alarming increase in the death-rate cannot be put down to prison influences entirely, but to an accumulation of old, chronic and debilitated cases.

Towards the end of the year the health of the prisoners was very satisfactory.

There was also an epidemic of mumps during the year, forty-eight cases having been treated.

SANITATION.

Provision is made for sixteen public vaccinators for the Colony and Protectorate; three are usually stationed in Freetown, the remainder at Bonthe and in the Protectorate. As a class, they are unsatisfactory in that they are for the most part semi-illiterate, unreliable, and their methods are crude, in spite of attempts at careful training. The attempt was made to train Protectorate natives and station them in the districts from which they came, but the candidates do not possess the standard of education required for carrying out vaccination and supervision of outbreaks of smallpox. It is hoped that better provision will soon be made for carrying out these important public health functions.

The sanitation of Freetown and immediate neighbourhood is in the hands of the medical officer of health, who has under him two European superintendent sanitary inspectors and a number of African sanitary inspectors.

Everywhere in Freetown the district medical officer is the medical officer of health of the district.

Portions of the Colony and the Protectorate is served by political officers, who naturally have little time for sanitation, but under whom some excellent work has been done in the laying out of headquarters and villages. African dispensers are stationed in a certain number of headquarters where there is no medical officer and supervise sanitary labour. The influence of Bo School, founded by the Government for the education of the sons and nominees of chiefs, has been considerable. The boys are housed in model villages in the school grounds, and take with them habits of tidiness, cleanliness and other attributes of hygiene, which many practise in after life to the marked advantage of the health of the Protectorate communities.

Ceremonial swords and certificates are given to

chiefs as rewards for excellent sanitary work done in their towns during the year, but in making the awards the Sanitary Department is not consulted.

In the greater part of Sierra Leone sanitary work is necessarily unorganized, without continuity, and with little regular plan. Things are often done by one man, undone by the next; some are keen on sanitation, others not, but usually, with the best of wills and energy, sanitation shows signs of amateurism. At present it cannot be helped; one must look to a better future, resulting from a larger sanitary staff and better sanitary legislation.

In the Colony sanitation is subject to the Public Health Ordinance, 1905, its amendments, and Ordinances dealing with quarantine, vaccination and other special matters. It is as well to recall here the remarks of Dr. Laurie, late Senior Sanitary Officer, in the Annual Report for 1916: "The Health Laws of the Colony are so scattered, so complicated and so unsuitable for application that sanitary development is very much hampered at present, and will always be, until laws are simplified, consolidated and brought more into harmony with those of other colonies."

Sanitation in the Protectorate is subject to the Public Health Ordinance, 1915. Those who activate the Ordinance are the Political Officer, the District Medical Officer, and, where there is one, the Sanitary Inspector. It is not an ideal procedure, but it was very carefully thought out, and was no doubt an excellent method of introducing sanitary legislation, sanitary ideas and authority where, formerly, there were little or none.

LEGISLATION.

Section 2 of the Public Health (Amendment) Ordinance, 1910, makes the finding of mosquito larvae a summary offence.

Cerebro-spinal meningitis, influenza and sleeping sickness were permanently made notifiable diseases under the Public Health Ordinance, 1905.

Vaccination was made compulsory in the Freetown Police District under the Vaccination Ordinance, 1918, when smallpox became epidemic in the city.

The importation of Japanese shaving brushes was prohibited under the Exports and Imports Prohibition Ordinance, 1920.

Quarantine (smallpox) regulations were applied to Freetown on April 4 under the Quarantine Ordinance, 1914, on account of Freetown being infected with smallpox.

Regulations under the Vaccination Ordinance allowed a fee of sixpence to be paid, with certain exceptions, for each successful vaccination to public vaccinators who are medical officers or qualified medical practitioners.

A consolidating Headmen Ordinance was passed during the year. Under it regulations may be made by the elected Headmen and Committees of Colony villages, dealing with such sanitary matters as cleaning and upkeep of cemeteries, roads, bridges and "other work" of a like character for the benefit of the town.

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Quarantine regulations, 1921, amend the older regulations, which had no legal provision for preventing ships from communicating with the shore or other vessels on arrival before being visited by the Harbour Master or Customs officer. They also give greater powers to compel ships to fly the quarantine flag, to prevent other craft approaching too near and the like when such action is necessary in the interests of the public health.

PREVENTIVE MEASURES AGAINST INSECT-BORNE DISEASES.*Malaria.*

(a) *House-to-house Inspection.*—During the year 92,378 houses were inspected, resulting in the discovery of 483 breeding places. 483 prosecutions followed with 407 convictions, realizing £94 14s. in fines, making an average of, approximately, 4s. 8d. per case.

A Mosquito Larvæ Index was taken at the end of each quarter, when the following results were obtained:—

March 1·2 per cent.

June not taken on account of small-pox outbreak.

September 4 per cent.

December 2·2 per cent.

Three hundred and fifty compounds were examined. Altogether 3,500 cases of mosquito larvæ were found in Freetown, chiefly in trees and mosquito breeding places.

(b) *Closing of wells.*—Forty-two wells were closed during the year, and, so far as can be ascertained, only twelve remain open. These will be closed early in 1922.

(c) *Oiling of Cesspits.*—Has been carried out in those which are found to contain water. A mixture of kerosene and solid disinfectant fluid was found very useful for the purpose. The two fluids mix very well and fly breeding is prevented as well as mosquito breeding.

(d) *Canalization of streams.*—The principal streams in the town were canalized and regulated at the end of the rains as in former years. Unfortunately this work does not last much after the first tornado of the following rainy season.

A large portion of Heddle Swamp was filled in during the rainy season, when the incinerators could not be burnt, with dustbin rubbish and afterwards covered with mangrove turf brought from the nearest unoccupied island, this being finally covered with sand.

At Pujehun, a belt thirty yards wide was cleared of bush and grass round the whole town mainly as an anti-mosquito measure.

At the new headquarters station at Pendembu, much good work was done by clearing bush, planting short grass and draining swamp in the neighbourhood, chiefly by straightening out and canalizing the streams.

At all stations paid and prison labour carried out anti-mosquito work on the usual lines. In stations

where there are soldiers and police (court messengers), these also do some sanitary work. In the colony villages the inhabitants themselves must give fourteen days' labour, either personal or by paid substitute, each year on work of a sanitary nature "for the benefit of the town." Owing to the financial state of the colony strict economy was necessary.

No case of yellow fever was reported during the year.

A case of trypanosomiasis in a European, probably contracted in the neighbourhood of Mabang, was reported in the Annual Medical Report for 1918. During the year under review, a European living at Mabang reported what he thought might be a death from sleeping sickness and a child sick with what he believed to be the same disease. He said there had been several cases during the last three years. Professor Blacklock, of the Sir Alfred Jones Freetown Research Laboratory, found trypanosomiasis in the child, which appears to have been infected at Ribbi Kenni. The child died before it could be removed to hospital. He subsequently made an extensive search for other cases at Mabang and at Ribbi Kenni, some ten miles down the Ribbi River, but could find only one other case. He came to the conclusion that "in regard to the districts dealt with, trypanosomiasis of human beings is a sporadic disease, and that only exceptional persons are affected by it. This condition would be in accordance with the condition of things which prevails in many parts of the West Coast of Africa, where a large proportion of persons appear to enjoy a relative immunity from trypanosomiasis." I came to a similar conclusion after examining many persons in a number of villages in the neighbourhood of Salaga in the northern territories of the Gold Coast in a report made in 1910.

Dr. C. H. Allan, of Bonthe, reports that he saw "a woman at Mattru who had typical clinical signs of sleeping sickness but no trypanosomes were found in the two slides taken."

PREVENTIVE MEASURES AGAINST INFECTIOUS AND EPIDEMIC DISEASE.

There were no cases of cerebrospinal meningitis recorded, and only two of influenza, i.e., two Europeans in hospital in Freetown.

Plague.

In Freetown:

(a) 8,578 rats were brought in and destroyed, being paid for at the rate of 3d. per rat.

(b) Barium carbonate and tincture of squills were used and, so far as could be judged, were satisfactory. The rat varnish recommended by the Medical Officer of Health of the City of London continued to be used, but with less satisfactory results, as the preparation sent out was evidently not the same as the first sample, which had proved so successful that, as reported in 1920, "once a rat was caught by this varnish it was never known to escape." The sanitary department is in correspondence with the manufacturers. Ordinary bird-lime was useless.

RETURN OF DISEASES AND DEATHS OF NATIVES IN 1921 IN THE HOSPITAL OF BOTH IN- AND OUT-PATIENTS, AT

Sierra Leone.

GENERAL DISEASES.

	Admitted	Deaths	Total Cases Treated
Alcoholism	1	—	1
Anæmia	3	2	276
Anthrax	—	—	—
Beriberi	49	3	56
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	38	—	7
Cholera	—	—	—
Choleraic Diarrhoea	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	1
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	37	10	129
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhoea	47	—	1,076
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	—	—	—
(a) Nodular	1	1	9
(b) Anaesthetic	—	—	6
(c) Mixed	—	—	—
Malarial Fever—	170	3	3,381
(a) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	29	—	368
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(b) Remittent	—	—	—
(c) Pernicious	—	—	—
(d) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	1	—	7
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	—	—	—
Other Diseases	200	24	592
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	—	—	—
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	3	2	5
Sleeping Sickness	1	—	1
Sloughing Phagedæna	—	—	—
Small pox	29	1	31
Syphilis	—	—	—
(a) Primary	1	—	63
(b) Secondary	83	9	503
(c) Tertiary	4	—	94
(d) Congenital	—	—	22
Tetanus	4	2	8
Trypanosoma Fever	—	—	—
Tubercle	29	19	116
(a) Phthisis Pulmonalis	—	—	—
(b) Tuberculosis of Glands	—	—	—
(c) Lupus	—	—	—

GENERAL DISEASES—continued.

(d) Tabes Mesenterica	—	—	—
(e) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping-cough	—	—	—
Yaws	3	—	301
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	51	1	530
Circulatory System	—	—	—
(a) Valvular Disease of Heart	28	15	185
(b) Other Diseases	15	2	155
Digestive System—	—	—	—
(a) Diarrhoea	60	6	1,071
(b) Hill Diarrhoea	—	—	—
(c) Hepatitis	10	2	82
Congestion of Liver	—	—	—
(d) Abscess of Liver	1	—	2
(e) Tropical Liver	—	—	—
(f) Jaundice, Catarrhal	33	—	111
(g) Cirrhosis of Liver	6	5	12
(h) Acute Yellow Atrophy	—	—	—
(i) Sprue	—	—	—
(j) Other Diseases	89	10	10,728
Ear	1	—	172
Eye	29	—	685
Generative System—	—	—	—
Male Organs	75	—	695
Female Organs	3	—	4,658
Lymphatic System	41	34	632
Mental Diseases	5	—	14
Nervous System	38	14	535
Nose	—	—	339
Organs of Locomotion	122	3	6,902
Respiratory System	90	4	6,001
Skin—	—	—	—
(a) Scabies	—	—	—
(b) Ringworm	—	—	—
(c) Tinea Imbricata	—	—	141
(d) Favus	—	—	—
(e) Eczema	10	—	257
(f) Other Diseases	159	6	4,746
Urinary System	46	12	185
Injuries, General, Local—	194	6	3,523
(a) Siriasis (Heatstroke)	—	—	—
(b) Sunstroke (Heat Prostration)	—	—	—
(c) Other Injuries	—	—	—
Parasites—	15	1	220
Ascaris lumbricoides	16	—	1,211
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	98	1	118
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bite	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	1	—	1
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(a) Cataract	—	—	—
(b) Iridectomy	—	—	—
(c) Other Eye Operations	—	—	—

Small-pox. Chicken-pox. Vaccination.

There was an outbreak of smallpox in Freetown, which was reported on as follows by Major Peacock, sanitary officer:—

Outbreak of April and May.

On 31st March a Bassa (Liberian) man living at 44, Macdonald Street, which is in the western area of the town, reported at the colonial hospital and was found to be suffering from small-pox. Examination of the other inmates of the house led to the discovery of five more cases.

On 1st April, a woman living at 62, Dundas Street, was found to have small-pox. She had been living at 44, Macdonald Street, where the first cases occurred, until about a week before, and left there about the time she became ill.

The same day two boys living at 6, Henry Street West were found to have small-pox. On examining the contacts in this house a woman was found who had had small-pox at Grand Bassa, Liberia, several months previously. She had arrived in Freetown from Grand Bassa fourteen days before the two boys took ill, and it is almost certain that, though cured herself, she brought the infection in her baggage. Small-pox was present at Grand Bassa during the early months of the year, but the first official intimation to that effect reached this office on 7th May. It is significant that the first nine cases reported were all Bassa people.

Subsequently, seventeen further cases were discovered, the last one on 22nd May, making a total of twenty-six.

Three of these cases were imported. One was a Kroo boy who arrived in Freetown on 5th May from Lagos by the s.s. "Abinsi." He was found on 10th May by Dr. T. C. Maxwell at 3 Chapel Street, in the course of house-to-house inspection, and at that time was practically cured. He gave a history of onset about 15th April. Another imported case was a man who probably contracted the disease at Daru and came to Freetown almost cured. A third imported case came from a village near Waterloo, but investigation there disclosed no further cases or history of recent small-pox. Apart from the imported cases all, except two, were living in the western area of the town at the time they were taken ill.

It is impossible to be quite certain of the origin of the outbreak, but it is at least probable that the greater part of the infection was introduced from Grand Bassa by natives from that place arriving in Freetown as deck passengers on steamers.

Measures for dealing with the outbreak may be summarized as follows:—

(a) Legislation: By Governor's Order of April 1, 1921, Freetown was declared an infected port and remained so until this Order was rescinded.

Quarantine (Small-pox) Regulations gazetted April 9, 1921.

Vaccination Order gazetted April 30, 1921, making vaccination compulsory throughout the Freetown Police District.

Appointment by the Governor of house-to-house visitors.

(b) The usual measures as regards cases and contacts were carried out. Patients were removed to the Infectious Diseases Hospital at Kissy. Houses were disinfected together with furniture, clothing and all articles likely to harbour infection. Contacts were examined, registered and vaccinated, and were inspected each morning at the medical officer of health's office for a period of sixteen days.

(c) A house-to-house inspection of the whole of the western area was carried out by the medical officers specially appointed for this purpose, each medical officer being accompanied by a vaccinator.

(d) Between March 31 and May 12, 5,800 vaccinations were performed in Freetown.

(e) Measures taken to prevent the exportation of the disease were in accordance with Quarantine (Small-pox) Regulations.

LATER CASES.

(a) On July 28 a policeman living at 22, Henry Street West, reported at the Colonial Hospital and was found to have small-pox in a mild form. He had been employed on steamers lying in the harbour and may possibly have contracted the disease in that way, but the fact that he was living in a street where previous cases had occurred in April should not be overlooked. The usual precautions were taken, including the inspection and vaccination of practically the whole of the police force, and no further cases occurred.

(b) On September 22 a mild case was discovered in Waterloo Street, the patient being a Mende labourer. The source of infection could not be traced. There was no spread of infection.

Small-pox was also reported at Daru (a slight outbreak amongst labourers painting a railway bridge and a few cases in a neighbouring district). These reported cases can only be a small proportion of all cases that occurred; medical officers and other officials are few and the natives are reluctant to report cases.

Chicken-pox, like small-pox, is always with us. Twenty-one cases were discovered in Freetown and sent to Kissy for treatment. They were mostly sanitary labourers. It is obvious that many more cases occurred, but were not brought to notice. Chicken-pox is not a notifiable disease.

As an instance of the difficulty of coming to a conclusion as to the nature of an outbreak when there is no medical officer available to investigate it, the following reported by the senior medical officer, Bonthe, is worth recording: "Small-pox was only reported once, the vaccinator on visiting called it chicken-pox; these were at a school on . . . They were boys between the ages of twelve and sixteen years, and the European in charge, when I next saw him, was convinced that they were cases of primary syphilis."

Dysentery.

Dr. J. Y. Wood, Medical Officer, reporting on the hospitals of Freetown remarks: "Dysentery has almost disappeared, only thirty-six cases, including

four cases in hospital from 1920, and including both Europeans and natives. No cases of dysentery were admitted to the European hospital during the year." The thirty-six cases mentioned include seventeen native out-patients in Freetown, but not those from the suburb of Cline Town nor the Prison.

The number of cases of dysentery treated in Government hospitals and dispensaries during the last seven years is shown in the following table, column A. The number of cases given in earlier annual reports (detailed case reports were burnt in the hospital fire) are differently classified and are therefore not comparable. A number of factors must be considered—reduction of medical staff, idiosyncrasy.

Year	A. Freetown in- and out-patients. Freetown prison, Cline town suburban dispensary	B. All Government institutions at which medical officers have been stationed throughout the period	C. All Government institutions except those under A. Those under B are included
1921	82	39	102
1920	149	96	255
1919	Fire at hospital: records destroyed	161	—
1918	278	116	296
1917	391	127	242
1916	307	131	321
1915	175	59	277

in diagnosis (particularly in the case of out-patients where the time at the disposal of the medical officer for each case is necessarily very small), fluctuation of population particularly during the war, and others; nevertheless the figures appear significant, and had it not been for the figures in columns B and C credit might have been taken by the Sanitary Department for much of the reduction in Freetown particularly on account of the closing of wells. In 1916 there were over 800 wells in Freetown, at the end of the year under review twelve. There is the inevitable fly in the amber: cases of dysentery elsewhere than in Freetown have decreased in somewhat similar ratio (column C) without any improvement in the water supply! Even if only stations are taken in which there has been a medical officer throughout these years (column B) a somewhat similar ratio is indicated. The closing of wells and improved sanitary conditions in Freetown, much as one would like to take credit for them, apparently have had little or nothing to do with the decrease of dysentery.

Leprosy.

The same two cases are still in the Kissy leper ward. Other cases under treatment were two prisoners in Freetown, four noted by the medical officer, Moyamba, five by the senior medical officer, Bonthe, with one death, and two others elsewhere by dispensers. The last-named officer remarks, "leprosy is prevalent."

Ankylostomiasis.

The remarks made by Dr. Laurie, late senior sanitary officer, in the annual report to the Medical Department for 1916, still hold good "Infection by ankylostomes is of very frequent occurrence and widespread distribution, but for many obvious reasons no means were adopted for its eradication outside

prisons and hospitals. By gradually enlightening the native and persuading him to follow a more rigid sanitary existence and dispense with some of his unhealthy institutions, a great deal of good may result . . . but it will be a long and tedious process."

Reports of 50 per cent. of infection of persons examined have been received from medical officers; in one case 84 per cent. in a prison. Infection appears to be slight and for the most part with little or no obvious symptoms.

PORT SANITARY WORK—FREETOWN.

Freetown was in quarantine on account of small-pox from April 1 to May 14, and precautions were taken as already indicated.

All ships arriving from infected places were medically inspected by the medical officer of health. No case of a notifiable infectious disease was discovered.

(a) GENERAL MEASURES.

Freetown.—The following is from the report of Dr. W. Allan, medical officer of health:—

General Sanitary Work.

(a) *Disposal of Refuse.*—The methods of disposal remain as before. During the dry season it is burned, and during the wet season the bulk of it is dumped into the sea. About 30 to 35 tons of combustible and incombustible refuse was removed from the streets daily, and an average of 12 canoe loads (each canoe load holding about 36 baskets) was taken out and dumped in mid-stream.

(b) *Sanitary inspections.*—Four thousand five hundred and thirty-two notices were served to remove insanitary conditions of premises, and 142 persons were fined for not removing insanitary conditions after notice.

(c) *Meat inspections.*—Two thousand four hundred and sixty-seven bullocks and six sheep were slaughtered in the public slaughter-house by native butchers for public sale; 711 bullocks, 156 sheep and 11 goats in the Imperial slaughter-house for the Imperial Government, and 511 bullocks, 212 sheep and 1 goat by the European butchery for public sale, making a total of 3,689 bullocks, 374 sheep and 12 goats slaughtered for food. Twenty-two bullocks and three quarters of beef were condemned and destroyed during the year by order of the police magistrate on account of infection with *Cysticercus bovis*.

(d) *Inspection of foodstuffs.*—In consideration of the amount of intestinal disorders in Freetown, an examination on a large scale of tinned foodstuffs was made in the different stores and shops. As a result large quantities were seized and destroyed by order of the police magistrate, including sugar, onions, biscuits, breakfast cocoa, pearl barley, salmon, bacon, baked beans, sardines, peaches, milk, sausages, margarine, pears, meat paste, camp-pie, quaker oats, cheese, pine-apples, herrings, cabbages, raspberries, plums, mixed vegetables, red cherries, green grapes, army rations, fruit pudding, halibut, pork and beans, sprats, soup and other vegetables.

Colonial Medical Reports.—No. 158.—Sierra Leone (contd.).*Sanitary Buildings.*

Incinerators, chutes and latrines were repaired during the year.

Waterworks.

The superintendent reports: All sections of the waterworks were kept in proper repair. The Venturi meters ordered from England have been working very satisfactorily, and have enabled the department to obtain accurate and permanent records of the consumption of water in the city.

There have been four new public stand-pipes erected during the year, making a total of 210. There were also thirty-eight private services installed, making a total of 360 (not including fifty-seven services to the Government and Municipal establishment and bungalows).

There was a shortage of water for nearly two months this year, during which period the city was placed on a restricted supply. The problem of further increasing the water supply will sooner or later have to be faced and seriously grappled with. The average daily consumption of water in the city for the whole year was 364,160 gallons.

Included in the sanitary work done at Sherbro during the year are:—

Erection of two latrines at Bonthe and one in the centre of the village at York Island. All these three latrines were made, unlike the older ones, with separate compartments for males and females. However, it will be some time, dealing with so many illiterates, before the people are taught which are the right compartments.

When Giema, the first model village, was visited by the senior sanitary officer, he found a well laid-out and clean village situated on a small plateau and its slopes. The chief, who was responsible for its building and was much to be congratulated on the result, had been to the Government school for the sons and nominees of chiefs. Some of the usual errors had been made in this primitive type of town planning undertaken by amateurs; roads were without camber, slopes were denuded of all vegetation and gutters were dug in the gravelly soil at the sides of roads, with the result that the torrential rains soon wore out irregular and deep channels, threatening both roads and houses. Nevertheless Giema is one of the best laid-out and cleanest villages the senior sanitary officer had seen in Sierra Leone.

A further instance indicating the gradual infiltration of improved ideas of sanitation throughout the Protectorate occur in the report of Dr. M. Jackson, medical officer, Daru: "Although the native town of Daru does not come within the Public Health (Protectorate) Ordinance, it is worth recording that the Chief of Daru has carefully renewed his town, which has now some very good and wide roads. The houses are all evenly spaced and laid out in a rectangular pattern similar to the barracks of the West African Frontier Force." The senior sanitary officer visited this town and found conditions as described. But again the result was partially spoilt by traces of

amateurism: a whole row of houses was put in the wrong place. Nevertheless, enormous advance is shown in this and other places recently visited. One curious feature is that the best laid-out of these protectorate towns are almost solely inhabited by the aborigines in marked contrast with those that have Europeans, Syrian and Creole traders amongst their inhabitants. The latter have been allowed to grow up irregularly, just "anyhow." A reason is that there is no difficulty in razing and rebuilding a purely native town, there are no vested rights, no expensive buildings, no leased plots, all of which necessitate large expenditure in compensation if there is alteration or removal.

Kennema is an instance of some of the difficulties the sanitary department has to contend with in its endeavour to improve the health of the African. The native town is served with three stand-pipes, water being pipe-borne from a dam in the hills. The taps are constantly stolen, with the result that water has to be turned off, leaving the inhabitants no alternative but to go back to the dirty water-holes and polluted wells.

At Hill Station the circumferential cleared area was somewhat increased; the levelling and planting with short grass was continued.

(b) MEASURES TAKEN TO SPREAD THE KNOWLEDGE OF HYGIENE AND SANITATION.

Dr. W. Allan, medical officer of health, reports that "a series of lectures on tropical sanitation for sanitary learners were given during the year by the medical officer of health. The series embraced lectures on mosquitoes and anti-mosquito measures, water and water supplies, purification of water, disposal of refuse, disposal of night soils and public health law treated in an elementary way. Six learners were promoted to fifth grade sanitary inspectors as the result of examination held during the year."

Dr. W. Allan also wrote a small pocket pamphlet being a "Manual of Instructions for Sanitary Inspectors and others," which has since been locally printed. To some extent it is a revision of his "Law and Regulations for the Guidance of Sanitary Constables," printed in 1914.

As a result of the findings of the local committee appointed in 1920 to investigate the causes of the high death-rate in many of the gaols of East and West Africa, "sanitary rules for prisons in Sierra Leone" were framed.

In practice the taking of meteorological observations falls for the most part upon African dispensers acting under the medical officer of the station, except in Freetown, which is a meteorological station of the second order of the international classification, and where observations are taken by a British non-commissioned officer of the R.A.M.C., placed at the disposal of the civil government by the military authorities for the purpose. "The Directions for Meteorological Observers" were distributed during the year in the hope that errors sometimes observed by sanitary officers when inspecting out-stations might be eliminated. As an instance, one observer was found to be trying to shake up what he called a bubble in the

column of the minimum thermometer instead of shaking down the disconnected portion of the alcohol. In another case an observer thought that '02 of an inch of rain meant 2 in. In one station—there was no medical officer there—the wet bulb thermometer was inside the water bottle! The life of a sanitary officer in West Africa is at times trying.

Mention should be made of the great asset which has accrued to this colony in the establishment at Freetown during the year of the Sir A. L. Jones Research Laboratory and the appointment of a director.

(c) MISCELLANEOUS VITAL STATISTICS.

There has always been a greater amount of sickness, as is to be expected, amongst railway European officials than amongst European officials generally, as is shown below.

TABLE SHOWING PERCENTAGE OF SICK TO AVERAGE NUMBER RESIDENT.

Year	All official Europeans	Railway European
1921 ...	3.45 ...	6.10
1920 ...	3.66 ...	7.17
1919 ...	Records destroyed in fire	6.52
1918 ...	4.30 ...	6.25
1917 ...	4.16 ...	4.76
1916 ...	2.05 ...	3.56
1915 ...	2.44 ...	3.27
1914 ...	1.96 ...	2.47
1913 ...	1.93 ...	3.50
1912 ...	.68 ...	1.19

An endeavour has been made to trace the causes of the increased sickness, but no outstanding features which might account for it have been discovered. The war years have, no doubt, had a great influence.

Freetown had 24,830 males and 19,312 females, the rest of the colony 22,734 males and 18,287 females. The males exceed the females by 28.5 per cent. and 23.2 per cent. in Freetown and the rest of the colony respectively.

(d) RECOMMENDATIONS FOR FUTURE WORK.

The financial condition of the colony is so bad that it is useless recommending anything that will cost money unless it is absolutely necessary. There is however one necessity. Freetown has no proper infectious diseases hospital. The old two-storied stone infectious diseases hospital in the suburb of Kissy with a high wall round it, with additional emergency huts within the same enclosure, and which was self-contained, was converted into a male infirmary during the year, because the old male infirmary building was too dangerous and had to be pulled down. The only accommodation for infectious cases now available consists of an old building within the old infirmary compound, but which is not properly enclosed, and has another building near it used for other cases, and some temporary "bush" huts within a broad wire fence. The result has been that the majority of cases have run away! So far it has not mattered much, as the cases have been chicken-pox. But had they been small-pox or plague. . . .

Legislation is wanted in several directions, amongst

others: A town planning ordinance; building regulations; a new public health ordinance. It is hoped that something along these lines will shortly be put before the Government.

In the 1915 Annual Report of the Medical Department under the head of "Some Difficulties" I mentioned: "Divided control of public health problems between the Senior Sanitary Officer of the Medical Department and the Sanitary Engineer of the Public Works Department," and "indefinite or undefined relationship between the sanitary and some other departments." Since then the relationship between the departments has been defined, yet the disability resulting from imperfect routine co-ordination still exists, but it is hoped that this difficulty, which is as old as the sanitary department—11 years of age—will shortly be overcome.

J. BERINGER,

Senior Sanitary Officer.

METEOROLOGICAL.

The rainy season of 1921 in Freetown was characterized by exceptionally heavy rainfall in August, the total for that month being 48.56 in., the highest reading since 1903.

This was in marked contrast to August, 1920, when the rainfall was 11.52 in., the lowest ever recorded in Freetown.

The highest rainfall recorded in any one day was 6.65 in., on August 22.

November, with a rainfall of 9.35 in., was also an abnormally wet month.

Rainfall records for Freetown, taken at Tower Hill Observatory, are now available for a period of forty years.

The average annual rainfall for this period was 152.46 in.

For the period 1882-1901 the average was 165.60 in., while for the period 1902-1921 it was 139.74 in. From 1908-1921 the rainfall was much below the average for the previous twenty-six years, and did not in any of these years reach 150 in.

HOSPITALS AND DISPENSARIES.

The old Law Courts buildings, affording the accommodation as mentioned in the report for 1920, since the destruction by fire of the old colonial hospital are still being used as a temporary native hospital.

During the year under review the total number treated as in-patients was practically the same as in 1920: the total being 753 with fifty-three deaths. Prevailing diseases: Malaria, pneumonia and bronchitis, digestive disturbances, ulcers and venereal disease.

In the dispensary, new cases dropped to 5,654, subsequent attendances making a total of 21,863.

Forty surgical operations were performed with one death.

In the maternity ward 142 cases were admitted. Of this number, 118 were purely labour cases, an increase of one over the previous year. Fifty were

primiparæ, ninety were normal and twenty-eight abnormal.

Of the births, ten were twins, three both male, three both female, and four mixed. Of single births sixty-four were males and forty-four females. There were twelve still-births.

THE KISSY INSTITUTIONS.

At the lunatic asylum there were 150 lunatics with nineteen deaths.

At the Kissy Infirmary there were 405 inmates, of whom seventy-six died.

Twenty-nine cases of smallpox and twenty-one of chicken-pox were isolated and treated at

the infectious diseases hospitals. Only one case of smallpox died.

Thus there has been a gradual and steady decline in the figures during the past five years due in all probability to a gradual return to pre-war conditions as is further indicated by the number of cases treated at the various hospitals and dispensaries.

SCIENTIFIC.

An attempt at a systematic investigation of the prevalence of and effect of treatment of ankylostomiasis has been carried out by medical officers at various stations. This will become the subject of a special report.

Colonial Medical Reports.—No. 159.—Bihar and Orissa.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF BIHAR AND ORISSA FOR 1921.

By **Lieut.-Col. W. C. ROSS, M.B., CH B., D.P.H., I.M.S.**,

Director of Public Health, Bihar and Orissa.

THE sections Meteorology, European Army, Indian Army and Jails, are no longer dealt with in provincial public health reports.

A brief note on the rainfall and the price of food-stuffs is, however, included in the next paragraph.

The rainfall for the year was sufficient in quantity and its distribution was generally favourable. There were good rains in January throughout the province and the rabi crops were generally good. The hot weather was remarkable for its high temperatures and its dryness. The monsoon was a little late in giving rain but the rains when once started were satisfactory in quantity and well distributed throughout the monsoon period, continuing into October before they finally ceased.

There were heavy floods in Saran district in September, but otherwise the rains were very favourable and the crops were good. The average price of common rice varied from 4 seers to the rupee in Muzaffarpur to 13 seers in Angul. In the majority of districts it was over 6 seers and the price fell rapidly towards the end of the year.

The year 1921 was on the whole not so healthy as the previous year, and was characterized by the prevalence of epidemic cholera in the Patna division. The prolongation of rains into the autumn months combined with the existence of conditions favourable to the spread of epidemic cholera in the Patna Division in the months of July and August were the chief causes of this result.

I do not consider that the relatively high prices of food and other necessary commodities are necessarily unfavourable to the health of the population so long as there is no actual state of scarcity. The provincial death-rate was 32·8 as compared with 30·9 in the previous year, and the birth-rate was 34·6 as compared with 32·2 in the previous year.

A new census was taken during the year and the revised population of the province is now 34,002,189. This does not include the population of the Tributary States of Orissa in which vital occurrences are not recorded.

The total number of births in the province during the year was 1,178,066 as compared with 1,113,468 in the previous year. The provincial birth-rate for the year 1921 was 34·6 as compared with 32·2 in 1920. The rate of increase of the population, i.e., the excess of the birth-rate over the death-rate, was 1·8 as compared with 1·3 in the previous year. A further rise in the birth-rate and the corresponding calculated increase in population indicate a further recovery from the conditions prevailing in the years 1918-20, which were adversely affected by the great influenza epidemic and to some extent by high prices and scarcity.

The birth-rate is still low but it has risen steadily during the last two years and is likely to rise still further if favourable conditions prevail. In this connection I noted last year that a rise in the birth-rate might confidently be expected this year and the rate has actually risen by 2·4 which is very satisfactory. The return to normal ratios after a severe diminution such as resulted from the great influenza epidemic takes time and requires climatic conditions favourable to the crops, and unfavourable to the spread of epidemic diseases. Such conditions never completely obtain and recovery is therefore slow, corresponding to the balance between favourable and unfavourable conditions.

The highest district birth-rate was 40·7, the lowest 26·9. Sahibganj and Sitamarhi head the municipalities with the high rates of 45·3 and 42·9 respectively.

The general birth-rate for the towns in the province

was 29.3 and for the districts was 34.6. The exceptions both high and low are few, and the variations do not greatly affect the average rate.

In the province as a whole the highest birth-rate was recorded in the months of September and October and the lowest in the hot weather months. This is usually the case and is a reflex of the climatic conditions prevailing at the different seasons of the year.

The total number of deaths in the province during the year was 1,116,423 as compared with 1,067,132 in the previous year. The provincial death-rate for 1921 was 32.8 as compared with 30.9 in 1920.

In last year's report it was noted that the death-rate had again reverted to normal or rather better. This is borne out by the rise of 1.9 now reported this year.

A high death-rate prevailing in Lalganj was due to plague and the high death-rates which prevailed in the districts of Gaya and Shahabad were due to the severe cholera epidemic which prevailed throughout the Patna Division.

In the province as a whole the highest death-rate was recorded in the month of August. Usually the first three months of the year show the highest death-rate and the hot weather the lowest. When there is any variation it is due to the prevalence of epidemic cholera in the summer months or malaria in the autumn. The variation during the year under report was due to the prevalence of epidemic cholera during part of July and August. Malaria was more prevalent during the autumn months but was not seriously epidemic.

The lowest mortality rates were recorded for the age periods between 10 and 15 years as in the preceding year. As usual the total combined mortality amongst males was higher than that amongst females in the ratio of 110 to 100.

There were as usual considerable differences in the death-rate amongst the different classes of the community. The death-rate was highest amongst Hindus (33.5) and lowest amongst Christians (19.7). The Muhammadan death-rate was 28.0 and that of other classes 33.0.

In the fifty-seven municipal towns where registration is compulsory, the accuracy of 31,652 vital occurrences was investigated by the health officers of the large towns and by the officers of the vaccination department. Two thousand four hundred and seventy-five omissions were detected, 221 prosecutions were instituted, 128 convictions were obtained.

In rural areas vital occurrences were verified by the vaccination staff, but as only 6,167 occurrences were verified throughout the province during the year, the value of this verification work cannot be great.

The preparation and publication every week of the vital statistics of all the municipalities in the province with a population of over 20,000 has been carried out throughout the year.

Weekly epidemic reports from all districts showing the number of seizures and deaths from cholera, small-pox, plague and influenza are also collected, summarized and circulated. These reports are published in the *Government Gazette* and also by the courtesy of the management in several newspapers of

the province. By the publication of these statistics it is hoped to keep the public informed of the actual state of health of the large towns, and of the prevalence of epidemic diseases in the districts, and to demonstrate the necessity for the accurate and rapid reporting of vital occurrences and of epidemic diseases, and the utility of vital statistics.

In last year's report, the reliability or rather the unreliability of registration was discussed, and also the associated questions of the value and the interpretation of vital statistics. There is little new to add on these points, but I desire to emphasize the point raised in these paragraphs last year with regard to the relationship between public health and economic conditions. In last year's report this was indicated but not elaborated:—

"The relationship between the economic condition of the people, the prevalence of epidemic diseases and the birth-rate and mortality amongst the population, is intimate and definite and each varies with the other."

"Nature adjusts the balance of population and food supply by means of the death-rate and the birth-rate, and these are therefore influenced primarily by the success or failure of the harvests. There is, therefore, an intimate relationship between public health and agriculture, and the betterment of the one must be accompanied by the improvement of the other if any real and permanent result is to be obtained. This becomes more obvious when one considers that in this province agriculture is the great national industry, and that the economic condition of the population is based upon the crops produced and may be measured in terms of the harvest."

Vital statistics are the barometer of public health. The improvement and even the maintenance of public health demand constant effort and supervision to overcome the tendency to "let things go"—that inertia which is the characteristic failing of the human race. The state of the public health is a balanced one, influenced for good by wisely directed effort, prosperity and favourable climatic conditions, and adversely affected by ignorance, negligence, laziness and unfavourable climatic and economic conditions.

If public health is to improve, progress and effort are essential, and these imply organization, the spread of knowledge and expenditure. The expenditure is the immediate difficulty which has been allowed to dominate the situation too long. It appears to create a "vicious circle"—the people are poor because they are not healthy; and they are unhealthy because they are poor; they cannot pay to acquire health; therefore nothing can be done.

This is where public health becomes an economic question. Let us look not on the difficulties and be not disheartened by the apparent impossibilities. But rather let us accept the proposition that public health is an economic question and must be dealt with accordingly. Let us admit that we must have funds to meet the expenditure which we know must be incurred if we are to make any real progress, and let us consider how we may obtain these funds rather than waste time in tinkering with the health of the people.

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(continued).

If we accept the general proposition which I have stated above that agriculture is the great national industry of this province, and the only important source of its prosperity; if we admit that the prosperity of the people depends upon the agricultural prosperity of the province, then we must look to improvement in agriculture to increase the prosperity of the people and to provide the means for improving their health, and to the creation of a "benign circle" whereby the improved health of the people will lead to greater production and greater prosperity, and so to still greater progress in public health. Let the "benign circle" replace the "vicious circle"!

The death-rate for the year is less than the average rate for the last ten years by 2·8 and there is a marked reduction in the incidence of plague.

There is a remarkable difference in the distribution of disease in urban and rural areas.

The infectious diseases, the spread of which largely depends upon overcrowding, density of population, and the consequent facilities for infection, are consistently more prevalent in the towns, whereas fevers, of which malaria is the chief, are more prevalent in the rural areas, where the facilities are greater for the breeding of anopheline mosquitoes, and where the economic condition of the people is frequently not so good.

The large towns are hot-beds of consumption, and this disease, together with pneumonia and influenza, causes the death-rate from respiratory diseases to be many times greater in towns than in rural areas. Similarly cholera and plague are more prevalent in the towns than in the villages.

The provincial death-rate from cholera rose from 0·7 in the previous year to 2·6 in 1921. This rate is the same as the average rate of the last ten years and is much higher than it ought to be. Cholera was somewhat prevalent in Cuttack throughout the year, and in Balasore during the cold weather and in Saran, Muzaffarpur and Darbhanga during July and August, and some cases were reported from almost all the other districts of the province, but these all proved to be sporadic or localized outbreaks of small dimensions.

The generalized and severe epidemic was confined to the area south of the Ganges and was localized in the Patna Division and the adjoining portion of the neighbouring districts of Monghyr, Hazaribagh and Palamau. The districts of Patna, Gaya and Shahabad recorded the highest death-rates from cholera, and amongst the towns Bhabhua recorded the highest rates.

Special cholera preventive measures were taken and a special staff was employed as usual in connection with the Rath Jatra Festival at Puri and at Sonapore fair.

The use of permanganate of potash and chlorinated lime for disinfecting wells has now been generally adopted by local bodies and the procedure is now generally known and appreciated.

A special epidemic cadre of ten sub-assistant surgeons was sanctioned for deputation duty throughout the province wherever epidemic disease was

prevalent. The officers of this cadre were employed on plague duty in Bihar, on cholera duty at Puri and subsequently on cholera duty in Bihar. It has never been possible to recruit this cadre to full strength as epidemic duty appears to be exceedingly unpopular and the terms of service have not been sufficiently attractive.

Out of 4,809 coolies recruited by Tea District Labour Association, 4,785 were inoculated against cholera, but no statistics are available as to the subsequent history of these recruits. It is very desirable that some records should be prepared and kept of the subsequent history of these coolies with regard to cholera, and if the Labour Association could have this done, such a record would after a few years throw great light on the usefulness of cholera inoculation and would show whether it was really worth while. During the year, 1,500 c.c. of vaccine were received and stocked in the vaccine depot for issue as required. 18,703 doses were issued to civil surgeons and others.

Since the end of the year under report arrangements have been made for the training of vaccinators and kabirajes in disinfection and simple preventive measures so that the village epidemics might be dealt with promptly by a local agency.

Cholera is endemic in this province, especially in Orissa, and frequently becomes epidemic during the hot months from April to October. The months of June, July and August are usually the months of greatest epidemic prevalence. The disease is a seasonal one in which climatic influences play a very important part as is indicated by the close relationship between temperature, humidity, and the prevalence of cholera in four characteristic divisions of the province. This province suffers heavily from cholera, having an average annual mortality of nearly one lakh. This incidence is higher than in most other provinces and may be accounted for by the climatic conditions being favourable to the spread of the disease for many months in the year and by the density of population which especially in Bihar is a most important factor. Great density of population renders easy and rapid the spread of any infectious disease. The risk of infection and the rapidity of spread are a mathematical function of the density of population which may be represented by $N^2 \cdot N$ where N is the number of persons in a given area of ordinary dimensions, e.g., a town or a few square miles of rural area. When N is one the risk is nil, which demonstrates the principle of isolation in infectious diseases. When N is a large number then $N^2 \cdot N$ is practically equal to N^2 and we may therefore put it that the risk and the spread of disease are in the ratio of the square of the population.

But whilst putting forward some explanation for the prevalence of cholera in this province I do not desire the main points to be overlooked. Fundamentally these are that cholera is a preventable disease and that the only source of infection is human excreta. The cholera germ does not live long outside the human body and if it can be killed by disinfection as soon as it appears upon the scene, we can largely prevent the spread of the disease.

As it is, the transmission must be rapid from the excreta of one case to the body of the next, and that this is so is illustrated by the rapidity with which epidemic cholera sweeps through a town or a district. It is, therefore, of primary importance to deal with the source of infection promptly and thoroughly in order to prevent the spread of the disease. This means that disinfection of the excreta and of all contaminated things must be done without delay. If this is done the disease cannot readily spread, so long as there is no chance for the infection to get into water, wells or food, or on to flies or people's hands. The time factor here is the all-important consideration. Every second's delay means risk and much delay means failure.

The immediate methods of prevention are not, however, the only means at our disposal and we must not overlook the importance of pure water supplies and good conservancy. I am still and strongly of opinion that the epidemic prevalence of cholera is largely associated with the prevalence of flies, and that good conservancy and the rapid removal and disposal of excreta (in which flies lay their eggs and breed) are fully as important measures for the prevention of cholera as the provision of pure water supplies, and that both these preventive measures should be widely adopted if cholera is to be prevented as an epidemic disease.

In previous sanitary reports it has been pointed out that any measures for the prevention of epidemic cholera necessitate prompt and rapid reporting of outbreaks, and the existence of some definite organization with some trained staff to take immediate action on receipt of such reports. Such measures cannot be centralized but must be carried out locally, because time is the important factor and because the organization must be prepared and equipped for immediate action. The work of cholera prevention is, therefore, one which can with great advantage be undertaken by district boards and municipalities both in the direction of arranging for prompt reporting and a skeleton organization with the necessary equipment for taking immediate action on the receipt of reports, and also in the direction of initiating and carrying out measures for the improvement of water supplies and conservancy.

As noted above there was a severe epidemic of cholera in the Patna Division during July and August, 1921, which was the subject of a special report at the time. The occurrence of epidemic cholera at that season was not unusual, but the epidemic was unusually severe and very rapid in its onset and spread. It was also definitely localized to the three districts of the Patna Division and the adjoining parts of the neighbouring districts.

As it was the magnitude and not the existence of the epidemic which was unusual, it was reasonable to infer that the conditions which gave rise to the epidemic were not of an abnormal nature but were regular and recurring. Now we know that cholera is usually epidemic to a greater or less degree at the same season every year and we know that that season is characterized by definite climatic conditions of

temperature and humidity, whatever be the month. These conditions are those which favour the rapid multiplication of flies which are known to play a prominent part in the transmission of cholera and other diseases; viz., warmth and moisture together. An excess of heat or of rainfall proves unfavourable just as much as a low temperature or low humidity. The optimum point is where the conditions of warmth and moisture together are most favourable to fly breeding, which appears to be at a mean temperature of about 85° F. and a humidity over 70° F.

During 1921 the climatic conditions were peculiarly favourable to the rapid multiplication of flies owing to the temporary failure of the rains for about five or six weeks after their first onset in the middle of June. The temperature and humidity were both favourable and there was no heavy rain nor floods to wash the land clean.

The relationship between cholera and climatic conditions favourable to the multiplication of flies does not imply that the fly is the only means of transmission. It is not. But its presence in large numbers may and probably does make that difference in the balance of things which prevents or precipitates an epidemic, which tends to spread more and more rapidly and widely when once the balance is upset. When, therefore, we consider that the conditions favouring the epidemic prevalence of cholera are regular and recurring and not of an abnormal nature, the facts and circumstances taken into consideration with the climatic conditions and the seasonal periodicity of such epidemic indicate that the fly is a most important factor in these epidemics.

The only alternative possibility is the water supply, and neither the facts nor the climatic conditions support such a view, nor is it possible for an epidemic to break out almost simultaneously all over a division which has an infinite number of separate water supplies, if the water supplies are the means of spreading the infection. With a common water-supply it would be possible, but in that case there would be no necessary seasonal periodicity, and as there is no common water-supply in any case, the theory is untenable.

The onset and spread of this epidemic were extraordinarily rapid and preventive measures were out of the question before there was time to organize them. Medical relief was an urgent necessity but very few medical men were available and many refused employment. Heavy rainfall was the only thing which would save the situation and fortunately we got that early in August and the cholera immediately began to abate.

The lesson of the epidemic was obvious. A preventive organization was required. The real meaning of prevention is that measures are taken in advance for the prevention of disease: the only possible way in which such measures can be effective is by the creation of a preventive staff and organization always ready and always in being and at work.

Organization is the essence of prevention; and it must be based upon local knowledge of the villages, the roads, the language, the conditions of life, and

the people themselves. Therefore good organization demands decentralization to the smallest possible units under the supervision and guidance of the district boards and their health officers.

The death-rate from small-pox was 0.2, as compared with 0.6 in the previous year, probably because of the early, prolonged, and very hot and dry hot weather. The death-rate fell in nineteen out of twenty-one districts.

In towns small-pox was severe in Barh, Gaya and Bhabhua.

It is well known that vaccination is the best and the only real means of prevention of small-pox, and yet vaccination is neither compulsory nor free. There is no doubt but that the cost of vaccination work is a splendid and profitable investment of public funds, which can save many lives and much sickness and suffering. It would, therefore, appear to be wise

and proper to organize the work more effectively and to make vaccination compulsory and free, in order to get the whole population protected and thus abolish a disease which is of all diseases the most easily and cheaply preventable.

Small-pox like most other epidemic diseases is a seasonal disease. It becomes prevalent in spring and is usually epidemic in the months of March, April, May and June. It is noteworthy that small-pox is prevalent in all climates during the same period, and is therefore not associated with either temperature, rainfall or humidity.

The manufacture of vaccine lymph and the organization and staff for vaccination work are all at present arranged for by Government and facilities are available throughout the province for getting the operation performed by trained vaccinators with pure vaccine.

Colonial Medical Reports.—No. 160.—Baghdad.

ANNUAL REPORT OF THE CITY OF BAGHDAD HEALTH DEPARTMENT FOR THE YEAR 1921.

By T. BARRETT HEGGS, T.D., M.D., D.P.H.

Medical Officer of Health.

A FOREWORD.

BAGHDAD from the point of view of its prevailing diseases is not a tropical city. The number of purely tropical diseases in Baghdad is exceedingly small. A little malaria exists (seventeen deaths in 250,000 people in a year), dermal leishmaniasis (Baghdad boils) is endemic, but is also found in Southern Europe, bilharzia is occasionally found and is always imported from the Euphrates, dysentery is rapidly diminishing as a purer water supply is provided. No cholera exists; plague, however, is endemic. The problems and work which face medical men here, whether clinical or administrative, do not differ widely from those of Europe. It is only a question of degree. We resemble, from a public health point of view, parts of Southern Europe. The mass of the disease is preventable. As usual the greatest obstacle to the health reformer is lack of education and a low standard of living among the mass of the people. The climate is not unhealthy. The sterilizing sun, the pure rivers, the dry atmosphere, and the cool northerly breezes giving cool nights even in the summer, are natural features in favour of the maintenance of good health. A sufficient and wholesome water supply, drainage and sewerage admitting of the abolition of the universal cesspits, a good system of refuse collection and disposal, good methods of control of infectious disease, better ventilation of houses, less congestion of houses and more open spaces, less overcrowding of persons within the houses, better milk and food control, and more arrangements for bringing good medical

attention within the reach of the poor are the public health requirements.

A strong national revival is now taking place, and a sense of public responsibility and of the proper duties of citizenship will follow.

The will to better things is arriving. I feel confident of the progress that will be made in public health affairs.

ON PROGRESS IN PUBLIC HEALTH AFFAIRS.

Public health administration must progress together with, or slightly ahead of, public opinion. It is impossible to rush such matters. Health legislation cannot be made in accordance with an enlightened minority, but must always be understandable and appreciable by the mass of the people. This does not mean that we must wait for the most ignorant, but that best results are not obtained unless the will and desire of the people as a whole are with us. We, however, should not wait to be forced into progress. The duty of a Health Authority is to educate and lead its people, but not beyond its understanding or its capacity to appreciate and to pay. A sense of proportion, a breadth of view and an ability to choose the essentials are qualities necessary in a public health reformer. I would remind my often impatient critics of a few facts. The first great Public Health Act of England was passed in 1875, but only in 1907 was there such a measure as the Medical Inspection of School Children. It was thirty-five years after the Public Health Act before municipal sanatoria were built and tuberculosis dispensaries

established and infant welfare clinics and venereal disease clinics begun. The awakening of public opinion is a gradual process, but the results are progressive though slow, and in avoiding hurry we avoid many mistakes and useless expenditure. It is my duty to lead and educate public opinion on what I know to be the right lines. In this educational work every enlightened citizen can take, and should take, an honourable part.

THE PREVENTION OF DISEASE.

The prevention of all disease is the duty of the State through its Public Health Authority. This includes not only epidemic and infectious diseases, but any disease causing mortality, suffering or financial loss to the citizens and so to the State. The prevention of disease cannot be divorced from the treatment of disease, for one of the best methods of preventing the spread of certain diseases is adequate and efficient treatment of the existing sufferers. This is particularly the case with tuberculosis, venereal diseases, malaria, bilharzia, dysentery, certain skin diseases and other infective and contagious disorders. In addition, in the matter of heredity many removable or preventable predispositions to disease can be avoided by the rectification of diseases and physical disabilities of the parent. The work of a Public Health Authority can logically be broadened to include all measures for the attainment of the complete physical and moral well-being of all its citizens and for the well-being of generations yet unborn. For practical purposes, however, it is desirable to concentrate public efforts upon the greatest evils and to combat the lesser evils as finance and opportunity allow.

For this purpose we ask ourselves: (1) What diseases are causing most death, suffering and loss of efficiency to the people? (2) Which of these diseases are in the present state of our knowledge preventable? (3) Can we afford to prevent them? (4) Are we doing what is reasonably possible to prevent them? This report is meant to answer these questions, upon the answers to which our future actions must depend.

A glance at our mortality statistics will show us much sickness, and invalidity statistics would show us more. Infectious disease statistics give one side of the picture. Hospital statistics give another. All this death, sickness and invalidity means waste. Waste of valuable lives and work to the State, waste of efficiency to the workshops, waste of effort to the individual, and waste or loss of money to all these.

Waste is uneconomic; it must be stopped. The death of our children, the sickness of our women, the invalidity of our men must be prevented.

What are the preventable diseases? *Firstly*, the epidemic diseases. These are highly infectious and spread rapidly through the community, such as cholera, plague, smallpox, typhus, influenza and measles. *Secondly*, the infective diseases, which are of a lower infectivity and yet are communicable to others, such as typhoid, dysentery, diphtheria, erysipelas, venereal diseases, bilharzia, tuberculosis,

malaria, pneumonia, enteritis, trachoma. *Thirdly*, certain non-infective diseases, which are usually considered not communicable, rheumatism, gastritis, nephritis, heart disease, asthma, pleurisy, bronchitis, indigestion, sciatica, nervous diseases and anæmia.

How are we to prevent them? For the epidemic diseases we recognize that there are preventive measures applicable to all these, which vary from protection of the individual by inoculation of a vaccine, to protection of the community and exclusion of the infection from the country by quarantine, &c., and which always include the isolation of sufferers. For the infective diseases, according to their infectivity and the progress of medical science, we apply methods of protective inoculation of individuals or sterilization of suspected sources of infection, or treatment of sufferers to render their disease not communicable and if necessary segregation of sufferers.

For the non-infective diseases we point out the evils of certain errors in diet, certain deleterious habits or customs of life, we provide hygienic education in schools or otherwise and build more hygienic houses.

We create a more healthy environment by sanitary engineering works, by protection of the public food, by sanitary disposal of waste materials, and by raising the standard of living.

Finally, to prevent all disease we follow the babe from its birth, through its education and training, through its life's work and to its death, and try at all stages to counteract those influences, both personal and environmental, which would tend to divert the physically normal national asset to the category of a diseased waste product.

This is the aim of preventive medicine, and these are the directions of its activities.

CLIMATE AND PHYSICAL FEATURES.

Baghdad, the ancient City of the Khalifs, lies on the banks of the river Tigris, in the centre of the great wide and flat valley between the highlands of West Persia and Kurdistan and the Arabian plateau. The city is placed in latitude N. 33° 21', longitude E. 44° 26', and the altitude is 123 ft.

According to the official meteorological report the peculiarities of the climate are as follows: Scanty rainfall, small vapour content in the atmosphere, large differences of temperature between night and day and between winter and summer, with a high mean annual air temperature. The rainfall just exceeds 6 in. per annum, and falls on an average of twenty-six days per annum evenly distributed between the six months—November to April. The cool season extends from November to April and the hot season from May to October.

During the cool season on the majority of days the sky is clear and of a rich blue colour, and the weather is like fine spring or summer days in England with occasional refreshing rain. The nights are cold with occasional frost. Altogether the climate of this season is most pleasant and invigorating.

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(continued).

During the hot weather there is neither rain to cool the air nor clouds to soften the heat rays, and the winds are hot and dry. However, even during the hottest weather there is a welcome breeze at night, so that sleep is always possible.

It is interesting to note that the general archaeological view is that the climate of Mesopotamia has undergone no appreciable change since the days of the Babylonian Empire.

The dominant wind all the year is north-west, and particularly so during the hot weather. A south-east wind is the usual precursor of rain.

The variation between day and night temperatures is excessive. The mean variation during the year is 26°. The relative humidity varies between 20 per cent. in July and 80 per cent. in January. Snow is rare in Baghdad, a fall being seen about once in five years.

Baghdad, therefore, should become an attractive winter resort for those persons living in humid climates who wish to avoid the damp winters of their homes by residence in a drier and sunnier climate.

THE INFLUENCE OF THE GEOLOGY OF IRAQ UPON THE HEALTH OF BAGHDAD.

Subsoil.—Baghdad being situated on a foundation of clay and having a fluctuating ground water level suffers from the need of free subsoil drainage. In a city dependent upon cesspools for the disposal of its liquid refuse this is a great drawback.

The danger of cholera, dysentery, diarrhoea, and such diseases is accentuated in these circumstances. A constantly fouled subsoil is a real danger, particularly as the type of house with enclosed courtyard open only to the sky and surrounded by buildings of two stories acts as an extracting ventilator to the subsoil and cesspool gases when the nightly breezes blow across the open mouth of these air wells.

The evening smell in such houses is of more than stagnant air, and is an indication of the impurity of the atmosphere; the prevalence of anæmia may be associated with this, and also tuberculosis, septic infections and other chronic ill-health. Another danger in Baghdad of this subsoil saturated with foul matter is the presence of an intermittent water service. This exposes us to the danger of enteric fever, dysentery and cholera. The remedy is sewerage and drainage of the city and the building of a more open type of house in the future.

Alluvial soil needs good drainage to render it a healthy building site. The high level of subsoil water may be responsible for the prevalence of sciatica, lumbago and other neuralgic affections. There is, however, an absence of rheumatic fever.

Atmosphere and Rainfall.—Baghdad, being on a low altitude and situated in the centre of sunk land between mountain ranges on the north and east and a plateau on the west, has an enervating atmosphere. It is deprived of invigorating breezes.

The prevalence of tuberculosis and anæmia may be associated with this. The scanty rainfall is responsible for the dust, and consequently the prevalence of trachoma and other eye diseases.

Water Supply.—Baghdad derives its drinking water from the Tigris, which contains a high percentage of dissolved calcium salts from the gypsum beds and sandstone and other ranges in the Persian hills. The water, therefore, supplies a necessary mineral constituent for bone formation, and although calculi in kidneys and bladder are not uncommon, their prevalence in natives of Baghdad is not extraordinary. Bladder calculi are common in the Euphrates area, and it is suggested that bilharzia, which is prevalent there, may be the origin of this incidence. Dyspepsia is very common, but may be attributed to the customary diet rather than to the water. The latter, however, from its high salt content may be a contributory factor. Simple goitre is frequently seen, though its actual incidence is unknown to me.

GENERAL DESCRIPTION OF BAGHDAD CITY.

The city of Baghdad covers an area of about four square miles and is divided into two portions, that on the left bank of the Tigris known as Rasafah, forming three-fourths of the whole city, and that on the right bank known as Karkh. Rasafah and Karkh present very different conditions, the former being a town with a very mixed population of Mohammedans, Jews and Christians of different sects, and containing most of the trading and commercial community and most of the wealthier residents.

Karkh, on the other hand, is a town of more primitive type with a population mainly of Mohammedans engaged in home industries and in labour. This part of the town is of distinctly Eastern character as compared with the cosmopolitan tendencies of Rasafah.

The Health Department also embraces the town of (1) Kadhmain, four miles north of the city on right bank, population 15,038, (2) Mu'adh'dham, four miles north of the city on left bank, population 10,002, (3) Karradah, three miles south of the city on the left bank of the Tigris, population, 16,000.

Population.—No accurate or detailed census of the population exists. The figures officially adopted by Government in 1919 for this report are as follows:—

Mohammedans	{	Sunni	...	130,000
		Shi'ah	...	54,000
Jews	...			50,000
Christians	...			15,000
Other religions	...			1,000
Total population				250,000

Until a complete and accurate census is made the vital statistics of the city will be unreliable. In the past birth- and death-rates have been totally unacceptable owing to the deficient registration of births and to a smaller extent of deaths also.

Local Physical Conditions.—The Tigris when in flood is apt to break through the banks and inundate vast tracts of country.

In 1896, during an exceptionally high flood (8 ft. in one night), the banks were broken through above the city, and the country round Baghdad was covered by a lake 25 miles long by 6 miles wide. The city was protected by its artificial bund, which now surrounds Baghdad East in a semi-arch; Baghdad West also has its protecting bund. Such flood water is many months in disappearing, and malaria then severely affects the outskirts of the city. The river in the city has a rise and fall of about 20 ft. and has a mean daily discharge of nearly 42,000 cubic ft. per second, which may be doubled in the flood season. The amount of matter in suspension in the water varies with the time of year up to as much as 755 parts per 100,000 in flood. The bulk of the dissolved salts are bicarbonate of lime, magnesias and some potash. The suspended matter contains 0.19 per cent. of phosphoric acid.

The high river level in flood, the high level of subsoil water and the absence of easy levels for drainage are difficulties that have to be overcome in the future sewerage of the city, but they are not insuperable.

Baghdad is open to the free winds from the desert. The narrow streets, high houses and absence of open spaces, however, prevent the city deriving the maximum benefit from its exposed position.

The town planning arrangements for the future developments of the city should provide for less crowding of houses and more open spaces.

Housing Conditions.—Baghdad East as seen in aeroplane photographs presents an almost solid mass of houses. There are practically no open places within the town with the exception of some garden land near the South Gate. There are very few streets suitable for wheeled traffic. One main artery runs from the North Gate to the South Gate through Baghdad East. The houses are built in almost solid blocks and back to back, with small lanes giving entry to the houses further from the wider streets. The widening of thoroughfares is being gradually undertaken.

Fortunately the type of house aimed at provides for a certain amount of space within the houses themselves. The universal plan on which they are constructed provides a central uncovered courtyard on to which the rooms open. Most of the houses are in two stories. The courtyard provides privacy and is the scene of most of the domestic activities.

The houses in the city may be classified in three main groups according to quality of construction.

(1) The best type of houses is built of good burnt brick well pointed. Internal walls are usually plastered, and good woodwork and internal windows are provided. There is a brick staircase, and an internal veranda runs round the courtyard and gives access to the upper rooms. Most of the lighting is from the courtyard. The courtyards of

these houses are well paved and drained, and trees and vines are frequently growing in them. Such houses often have deeply built basement rooms called *sirdabs*, which are used in the hot weather and are much cooler than the ordinary rooms. They are ventilated by shafts going up to the roof. Houses of this type are quite pleasant to live in. An entry from an unpromising and narrow lane to such a house often brings one into surroundings which are unexpectedly good. Houses of this sort are found to a considerable extent in the central and northern areas of Baghdad East, and are fewer in Baghdad West.

(2) The second-class of house is of inferior burnt brick construction, often in disrepair, and with a courtyard badly or incompletely paved. Woodwork and verandas are poor and the rooms unusually small. This type of house forms a large proportion of those in Baghdad East, and there are a considerable number in Baghdad West.

(3) The third type of house is of very poor construction, built partially of burnt or unburnt brick or wholly of mud brick. Courtyards usually unpaved and all house fittings of poor quality. Dilapidation is usual. Many of these houses consist merely of two or three small rooms surrounding a rough unpaved courtyard. These are common in Baghdad West and on the outskirts and poorer parts of the Baghdad East.

In addition to these three types there are at present many rudely constructed houses made of mud brick; they furnish a rude shelter, and have been erected by their occupants on the ruins of the old dilapidated houses. They are mostly found on the perimeter in the poorest areas.

Overcrowding is universal in Baghdad at present in all but the better-class areas. This is largely due to the fact that building materials were not available during the war either for repair or new construction. Dilapidation of buildings is common throughout the town, and especially in the poorer areas. Repair and new construction are now proceeding rapidly, in spite of the very high price of materials.

House inspection has shown the degree of overcrowding in the various areas. The figures show that the number of persons per room increases markedly with the poverty of the locality and with defective house construction. Individual instances of as many as fifty persons living in a house of nine rooms and twenty-five persons in a house of five rooms have been found.

Rents are excessively high, and there is urgent need for more house accommodation.

Drainage of Houses.—The most marked sanitary defect of all the houses in Baghdad is the primitive method used for disposal of surface and waste water and night soil. In every house there are one or more cesspools built in the courtyard. These cesspools are deep brick-lined pits roofed with flat brick with a small hole in the centre to admit the water. They are usually not cement-lined, and the water entering them percolates into the subsoil.

During the winter and spring the high level of subsoil water interferes with the percolation of the water from cesspools, and these also sometimes fill up with subsoil water. All surface drainage and all domestic waste water goes into these pits, and after a period of usage they frequently become foul and objectionable, a heavy sludge forming at the bottom. The foul odour from cesspools, especially on warm evenings, gives rise to much nuisance.

The best remedy is the sewerage of the city, the only objection to which is the cost, so that cesspools must remain until it is possible for the municipality to face the cost of the main drainage of the city.

THE DEFICIENCIES OF THE MEDICAL SERVICES OF BAGHDAD CITY.

Certificates of deaths issued during the year 1921 by the medical practitioners and others were as follows:—

By private practitioners in the city ...	338
By the Male General Hospital ...	290
By the Isolation Hospital ...	138
By the Hospital for Women and Children ...	102
By the Jewish Hospital ...	19
By the Civil Jail ...	8
Total certified by medical men...	895
Persons dying without qualified medical attention ...	4,692
Total ...	5,587

The position is therefore that only 16 per cent., or one in every six persons dying in Baghdad, is seen by a qualified medical practitioner. In Cairo only 30 per cent. of the deaths are certified by a medical man.

There are approximately thirty-five qualified practitioners in practice in Baghdad, or one for every 7,000 population.

(1) There are insufficient doctors in the city for the proper medical attention of the people. For instance, there is no qualified private medical practitioner living in Baghdad West which has a population of approximately 50,000 persons.

(2) The ignorant poor are fatalists and accept the visitation of disease as a matter beyond their control or their help.

(3) The ordinary fees of the medical practitioners are beyond the means of a large part of the people. There is therefore urgent need for more doctors, particularly for the poor.

These should be Arabic speaking and preferably natives of the country. The best means of providing them is by a medical school for Iraq. The next requirement is for free dispensaries in the poor quarters of the city. There is one for Baghdad West in Ras al Jisr, but free medical attention at the homes of the poor should be provided from these dispensaries. Poverty should be the only test. The doctor should be resident at the dispensary so as to be available night and day. For Baghdad East two of these are required, one in

Baghdad North, say, in neighbourhood of Fadhl and one in Baghdad South, say, in the Sadriyah area. The large general hospital in Baghdad East is beyond the north gate, too far away for general dispensary use. The provision of these dispensaries was approved by the municipality in 1922. The fees of the doctors have risen with the cost of living. Rents and all the necessities of life in Baghdad are expensive, but they will fall again with the cost of living. In the meantime unqualified practice prevails, and is the only form of home treatment available to the poor.

District nursing or the provision of trained nurses to attend the sick poor in their homes awaits the recognition by public opinion of its necessity. What the public want in these democratic days they can have. The voice of the people is beginning to be heard. What the city wants, however, it must be prepared to pay for. The hospitals of the city are doing the best of work, each according to its capacity. The male hospital of the city is the New General Hospital (500 beds), which is equipped on modern lines with an X-ray specialist, bacteriologist, surgeons and physicians of repute, but the buildings are the Army huts as provided for an Indian Troops Hospital by the British Army. The female hospital of the city (the Women and Children's Hospital, Baghdad West) is a credit to the Health Service. Under expert direction and staffed with the élite of the profession in Baghdad and a sympathetic nursing staff, it is a most popular and, therefore, most useful institution, carrying out excellent work for Baghdad. This institution needs enlarging or relieving by the provision of a separate hospital for children.

The Women's Hospital for Venereal Disease is a necessary adjunct to the control of prostitutes; it is in the hands of the civil surgeon of Baghdad and is confined to this class of patient.

The City Isolation Hospital is the main weapon of the City Health Department in fighting epidemic disease. In addition to the diseases which are compulsorily removed there, we admit cases of pulmonary tuberculosis voluntarily. The hospital certainly has served its purpose in the past and is steadily gaining the confidence of the public.

This is the present hospital accommodation in the city for civilians, which greatly exceeds the provision made in pre-war days both in quantity and quality. In addition a special hospital for Jews is maintained by the Jewish community.

The greatest hospital need in Baghdad is proper accommodation for the male general hospital (New General Hospital), now in temporary buildings unsuitable for summer as well as for winter use. The next need is for a special eye hospital. Eye disease is responsible in Baghdad for more industrial and other incapacity than any other forms of disease. At present a few beds are provided in the various general hospitals. The third need is for a special children's hospital which would allow of the extension of the maternity and general work of the Women and Children's Hospital.

As will be readily understood, the work of the hospitals could not be maintained at its present

high scientific standard without the services of the highly equipped Central Pathological Laboratory with its able Director. This laboratory has been of great service to the general practitioners of the city to the City Health Department as well as to the hospitals.

The chemical and analytical laboratory is also a valuable asset to the City Health Department as well as to the hospital service.

These hospitals and other institutions are not controlled in any way by the municipality. The above description and comments are made solely for the information of the public as they have a great bearing upon the general health of the city. The Ministry of Health directly controls all these institutions.

Other medical requirements for the future to fully equip the city are:—

(1) A better school medical service. The present arrangements are totally inadequate and are dealt with elsewhere in the report.

(2) A medical officer in charge of the maternity and child welfare work of the city. This doctor might be in charge of the Maternity Home, the training of midwives, the organization for infant welfare, infant clinics and certain infant beds in the Children's Hospital.

For the City Health Department it is proposed in the year 1922-23 to provide three assistants to the M.O.H., each responsible for one-third of the city to act as medical officer to the Mudir of that section of the city, controlling the sanitary staff, and being responsible for all preventive work in his area to the Medical Officer of Health.

VITAL STATISTICS.

May be defined as "the science of numbers applied to the life-history of communities and nations" (Sir Arthur Newsholme).

Facts or experience may be interpreted according to the character of the observer. The "sometimes" of the cautious is the "often" of the sanguine, the "always" of the empiric and the "never" of the sceptic, while the numbers 1, 10, 100, and 10,000 have but one meaning for all mankind (Dr. Guy).

Statistics supply a common standard wherewith to measure our experience. They often correct false impression and defective opinions, they enable the adviser to present his argument in concrete tangible form, but they are only trustworthy to the extent that the sources of information are reliable. In my case the sources of information are all more or less defective, an error which will be rectified in a few years. Inaccurate census returns, incorrect registration figures, non-medical certification of death, concealment of infectious disease are all factors of unreliability. Nevertheless, the figures are something more than interesting, and sifting the grain from the chaff we may find them enlightening.

Notification and Registration of Births.—Under a notification of the Military Governor during the military occupation of Baghdad the duty of notify-

ing births to the Health Department was placed upon the Mukhtars of Mahallahs. The result has always been bad. The reasons are several. Firstly, the Mukhtars have not been kept up to this work. Certain of them have been reported by me on many occasions for neglecting this work, but sufficient action was not taken to rectify their defeets. There has been no discipline in these services. Secondly, the Mukhtars have not always been informed by the parents, as the latter fear the coming of conscription for the army, and believe that to omit registration of births will perhaps enable their children to avoid this service. For these reasons the dates of births are sometimes falsified and given as months later than they actually were. Thirdly, birth registration certificates are not demanded for any official purpose, such as for school entrance, &c. The responsibility for notification of births should be jointly upon parents and those in attendance at the confinement, medical attendant or midwife, and should be compulsory within forty-eight hours. A law is required for this which should include stillbirths and miscarriages.

Number of births registered in 1921, 2,022.

I know of no reason to believe that the birth-rate of Baghdad is less than Palestine, viz., 25 per 1,000 population, so that there should be three times the present number of births recorded. The table of births among the various sects of religion shows that a lower birth-rate is recorded among the Mohammedans than the other religions.

Notification and Registration of Deaths.—The duty of registering deaths was, as with births, placed upon Mukhtars by a military order. Together with the order for notification of deaths, however, is an order compelling a burial certificate issued from the Health Department before burial is permitted in any cemetery in the city. For conveyance of corpses to the holy places a Health Department pass is required also. Deaths are, therefore, much better controlled than births, and I am satisfied that the figures for the deaths are reasonably accurate.

The procedure is as follows: Notification of a death must be made to the Health Department in order to obtain a burial certificate. Unless the certificate of death is signed by a medical man, the Health Department inspects each body and reports the circumstances of the death to the Medical Officer of Health, who certifies the cause of death from such report. The burial certificate is then granted. In this way cases of infectious disease are discovered and the necessary precautions taken with the burial. Passes of transit to holy places are withheld in cases of infectious diseases. Classification of cause of death from post-mortem investigation is not satisfactory, but gives information which otherwise would be unobtainable and is a valuable safeguard to the public health.

In case of serious doubt the Medical Officer of Health visits and inspects the corpse. Where foul play is suspected a post-mortem examination is insisted upon by the police on the advice of the Medical Officer of Health.

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